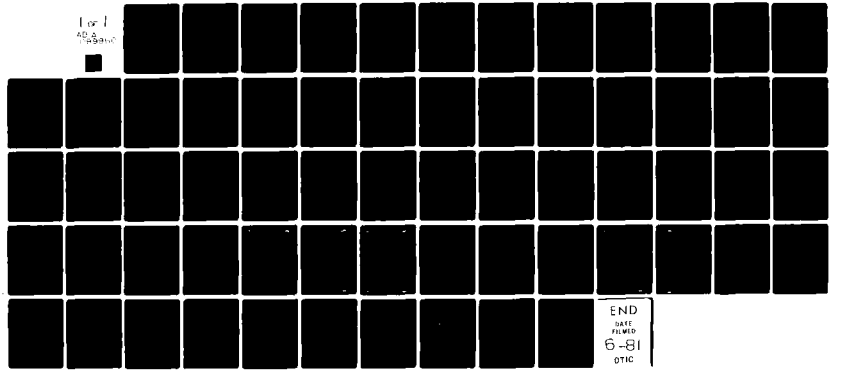
AD-A099 950 COURSEWARE INC SAN DIEGO CALIF F/G 5/9
COMPUTER MANAGED INSTRUCTION FOR THE F-16 TRAINING PROGRAM.(U)
MAR 81 A F O'NEAL, G P KEARSLEY F02604-79-C-8875
UNCLASSIFIED NL



F-16 AIRCREW TRAINING DEVELOPMENT PROJECT

Contract No. F02604-79-C8875

COMPUTER MANAGED INSTRUCTION FOR THE F-16 TRAINING PROGRAM

DEVELOPMENT REPORT No. 17
MARCH 1981

Prepared in partial fulfillment of
CDRL nos. B029, B032, and B033

by

A.F. O'Neal
G.P. Kearsley

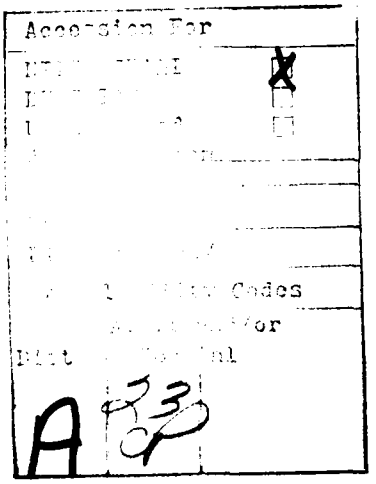
COURSEWARE, INC.
10075 Carroll Canyon Road
San Diego, CA 92131
(714) 578-1700

DISCLAIMER NOTICE

THIS DOCUMENT IS BEST QUALITY PRACTICABLE. THE COPY FURNISHED TO DTIC CONTAINED A SIGNIFICANT NUMBER OF PAGES WHICH DO NOT REPRODUCE LEGIBLY.

PREFACE

This report was created for the F-16 Aircrew Training Development Project contract no. F02604-79-C8875 for the Tactical Air Command to comply with the requirements of CDRL nos. B029, B032, and B033. The project entailed the design and development of an instructional system for the F-16 RTU and instructor pilots. During the course of the project, a series of development reports was issued describing processes and products. A list of those reports follows this page. The user is referred to Report No. 34, A Users Guide to the F-16 Training Development Reports, for an overview and explanation of the series, and Report No. 35, F-16 Final Report, for an overview of the Instructional System Development Project.



F-16 AIRCREW TRAINING
DEVELOPMENT PROJECT REPORTS

Copies of these reports may be obtained by writing the Defense Technical Information Center, Cameron Station, Alexandria, Virginia 22314. All reports were reviewed and updated in March 81.

Gibbons, A.S., Rolnick, S.J., Mudrick, D. & Farrow, D.R. Program work plan (F-16 Development Report No. 1). San Diego, Calif.: Courseware, Inc., September 1977, March 1981.

Thompson, A., Bath, W., & Gibbons, A.S., Previous ISD program review (F-16 Development Report No. 2). San Diego, Calif.: Courseware, Inc., September 1977, March 1981.

Wild, M., & Farrow, D.R. Data collection and management forms report (F-16 Development Report No. 3). San Diego, Calif.: Courseware, Inc., September 1977, March 1981.

Gibbons, A.S. Review of existing F-16 task analysis (F-16 Development Report No. 4). San Diego, Calif.: Courseware, Inc., June 1977, March 1981.

Gibbons, A.S., & Rolnick, S.J. Derivation, formatting, and use of criterion-referenced objectives (CROs) and criterion-referenced tests (CRTs) (F-16 Development Report No. 5). San Diego, Calif.: Courseware, Inc., September 1977, March 1981.

Rolnick, S.J., Mudrick, D., Gibbons, A.S. & Clark, J. F-16 task analysis, criterion-referenced objective, and objectives hierarchy report (F-16 Development Report No. 6). San Diego, Calif.: Courseware, Inc., October 1978, March 1981.

Gibbons, A.S. Task analysis methodology report (F-16 Development Report No. 7). San Diego, Calif.: Courseware, Inc., October 1978, March 1981.

Gibbons, A.S. Objectives hierarchy analysis methodology report (F-16 Development Report No. 8). San Diego, Calif.: Courseware, Inc., October 1978, March 1981.

Mudrick, D., Gibbons, A.S., & Schmidt, R.F. Goal analysis report (F-16 Development Report No. 9). San Diego, Calif.: Courseware, Inc., February 1978, March 1981.

Rolnick, S.J., Mudrick, D., & Thompson, E.A. Data base update procedures report (F-16 Development Report No. 10). San Diego, Calif.: Courseware, Inc., October 1978, March 1981.

Mudrick, D., & Pyrz, K.E. Data automation of task and goal analysis: Existing system review and recommendation (F-16 Development Report No. 11). San Diego, Calif.: Courseware, Inc., September 1977, March 1981.

O'Neal, A.F., & Smith, L.H. Management System needs and design concept analysis (F-16 Development Report No. 12). San Diego, Calif.: Courseware, Inc., December 1977, March 1981.

Gibbons, A.S., Thompson, E.A., Schmidt, R.F., & Rolnick, S.J. F-16 pilot and instructor pilot target population study (F-16 Development Report No. 13). San Diego, Calif.: Courseware, Inc., September 1977, March 1981.

Schmidt, R.F., Gibbons, A.S., Jacobs, R. & Faust, G.W. Recommendations for the F-16 performance measurement system (F-16 Development Report No. 14). San Diego, Calif.: Courseware, Inc., October 1978, March 1981.

Thompson, E.A., & Gibbons, A.S. Program/system constraints analysis report (F-16 Development Report No. 15). San Diego, Calif.: Courseware, Inc., October 1978, March 1981.

Gibbons, A.S., & Rolnick, S.J. A study of media production and reproduction options for the F-16 project (F-16 Development Report No. 16). San Diego, Calif.: Courseware, Inc., February 1978, March 1981.

O'Neal, A.F., & Kearsley, G.P. Computer managed instruction for the F-16 training program (F-16 Development Report No. 17). San Diego, Calif.: Courseware, Inc., July 1978, March 1981.

Wilcox, W.C., McNabb, W.J., & Farrow, D.R. F-16 implementation and management plan report (F-16 Development Report No. 18). San Diego, Calif.: Courseware, Inc., October 1978, March 1981.

Sudweeks, R.R., Rolnick, S.J., & Gibbons, A.S. Quality control plans, procedures, and rationale for the F-16 pilot training system (F-16 Development Report No. 19). San Diego, Calif.: Courseware, Inc., October 1978, March 1981.

Gibbons, A.S., Axtell, R.H., & Hughes, J.A. F-16 media selection and utilization plan report (F-16 Development Report No. 20). San Diego, Calif.: Courseware, Inc., October 1978, March 1981.

Thompson, E.A., Kearsley, G.P., Gibbons, A.S., & King, K. F-16 instructional system cost study report (F-16 Development Report No. 21). San Diego, Calif.: Courseware, Inc., October 1978, March 1981.

Jacobs, R.S., & Gibbons, A.S. Recommendations for F-16 operational flight trainer (OFT) design improvements (F-16 Development Report No. 22). San Diego, Calif.: Courseware, Inc., October 1978, March 1981.

Gibbons, A.S. F-16 instructional sequencing plan report (F-16 Development Report No. 23). San Diego, Calif.: Courseware, Inc., October 1978, March 1981.

Farrow, D.R., & King, K. F-16 coursewares and syllabi delivery schedule (F-16 Development Report No. 24). San Diego, Calif.: Courseware, Inc., September 1979, March 1981.

Rothstein, L.J., Hibian, J.E., & Mudrick, D. F-16 instructor/course manager training requirements report (F-16 Development Report No. 25). San Diego, Calif.: Courseware, Inc., October 1978, March 1981.

O'Neal, A.F., & O'Neal, H.L. F-16 pilot media selection (F-16 Development Report No. 26). San Diego, Calif.: Courseware, Inc., March 1979, March 1981.

Gibbons, A.S. F-16 instructional system design alternatives (F-16 Development Report No. 27). San Diego, Calif.: Courseware, Inc., September 1979, March 1981.

Gibbons, A.S. F-16 instructional system basing concept (F-16 Development Report No. 28). San Diego, Calif.: Courseware, Inc., September 1979, March 1981.

O'Neal, H.L., & Rothstein, L.J. Task listings and criterion-referenced objectives for the instructor pilot F-16 training program (F-16 Development Report No. 29). San Diego, Calif.: Courseware, Inc., September 1979, March 1981.

Bergman, D.W., & Farrow, D.R. F-16 training system media report (F-16 Development Report No. 30). San Diego, Calif.: Courseware, Inc., September 1979, March 1981.

Gibbons, A.S., O'Neal, A.F., Farrow, D.R., Axtell, R.H., & Hughes, J.A. F-16 training media mix (F-16 Development Report No. 31). San Diego, Calif.: Courseware, Inc. October, 1979, March 1981.

Farrow, D.R. F-16 training media support requirements (F-16 Development Report No. 32). San Diego, Calif.: Courseware, Inc., September 1979, March 1981.

Gibbons, A.S. F-16 training media constraints and limitations (F-16 Development Report No. 33). San Diego, Calif.: Courseware, Inc., September 1979, March 1981.

Farrow, D.R., & Kearsley, G.P. A user's guide to the F-16 training development reports (F-16 Development Report No. 34). San Diego, Calif.: Courseware, Inc., January 1981, March 1981.

Farrow, D.R., & Clark, J. F-16 Final Report (F-16 Development Report No. 35). San Diego, Calif.: Courseware, Inc., January 1981, March 1981.

EXECUTIVE SUMMARY

The computer managed instructional (CMI) system required for the F-16 training program must include components for automatic testing, record keeping, student scheduling, inventory tracking, and instructional prescriptions. The testing components must provide facilities for test grading, diagnostic testing, and test security, as well as adequate student feedback capability. It must also permit the evaluation of instructional effectiveness and facilitate course revision. The student records component must encompass bibliographic information, training performance data, report generation of records, and multiple sorting capabilities. The scheduling component must provide the capabilities for the optimized scheduling of student learning activities and training resources. This scheduling capability must exist at the levels of syllabus and weekly and daily timetables. The inventory component must provide short- and long-term information on all resource utilization and availability, including personnel, equipment, facilities, and supplies. The prescriptive component must provide the capability to generate individualized student learning schedules based upon student performance data, as well as training resource availability and utilization.

Five existing instructional systems which could serve as the basis for the F-16 CMI system are surveyed. For each of the systems a functional description and examples of input/output are provided. The five systems studied were AFORMS, TICCIT, VTS, Navy CMI, and AIS. None of the five systems surveyed could satisfy all of the capabilities required in the functional specifications for the F-16 training environment, and the limitations of each are mentioned.

A cost benefit analysis considered the general cost benefits applicable to the F-16 environment. These include savings in the amount of training time required, more effective utilization of training resources, improved quality control, increased standardization and flexibility in the training system, and greater field deployability and expandibility. Specific cost considerations for the F-16 program were made by extrapolating from data on the F-4/F-15 training programs. The specific cost savings projected on this basis were a time reduction of two weeks in course durations, or 25 student salaries for the training period; 10 man years of instructor time per course; and 17 full-time administrative support personnel.

The conclusion of the study considered the five systems surveyed in the report in terms of functional capabilities, operational status, remote capability, training status, and cost factors. Although any of the five systems could be used as a basis for the F-16 CMI system, it was recommended that VTS is presently the most suitable system, because it a) meets nearly all of the functional requirements, b) is relatively inexpensive, c) is basically a "stand-alone" system, d) is currently in use for aircrew training and is an approved military training device, and e) has sufficient scope to support a full-scale training system.

CONTENTS

COMPUTER MANAGED INSTRUCTION
FOR THE
F-16 TRAINING PROGRAM

1.0 INTRODUCTION

This study, representing the deliverable for CDRL B032, consists of four major parts: (1) a functional specification of the F-16 computer managed instruction (CMI) system which meets the needs outlined in the F-16 Training Management System Needs and Design Concept Analysis (F-16 Aircrew Training Development Project Report No. 12, September 1980, prepared by O'Neal and Smith); (2) an analysis of existing systems which could serve as the basis of the F-16 CMI system; (3) a cost benefit analysis which serves as a support rationale for the specification; and (4) conclusions and recommendations for the F-16 training program.

2.0 F-16 CMI FUNCTIONAL SPECIFICATIONS

This CMI system shall consist of five management components which are all interrelated and interdependent. These components include student testing, course record keeping, scheduling, inventory tracking, and prescription of new instruction. This section provides the functional specifications for each of these five components.

2.1 Testing Component

The testing component performs three functions: (1) assesses student performance level, (2) provides student feedback, and (3) provides evidence for the instructional effectiveness of the course.

2.1.1 Assessing the performance level of the student involves a test grading function, a diagnostic subtesting capability, and control features which minimize the possibility of test cheating.

2.1.1.1 Grading Tests. Automatic test grading shall include the capability to read and grade hard copy test forms and record/store these grades. It shall also record the time required to accomplish the training segment and the number of trials to criteria. (Time required to accomplish, and trials to criteria shall establish a data base for the scheduling component in terms of estimating student rate of progress).

2.1.1.2 Diagnostic Testing. A diagnostic testing function shall be included. This function will allow sub-testing to explore student weakness areas in terms of specific skills not mastered. This allows effective treatment of student misunderstandings and reduces the amount of remedial/review instruction required. (This information is input to the prescriptive component.)

2.1.1.3 Control Feature. In order to ensure the integrity of student performance information, control features shall be included in the system. These features are essential in an individualized instruction environment since tests are likely to be taken at different times. Hence, cheating can be a problem. These control features shall involve the accumulation of a large pool of test items for each objective and the random selection of items from this pool to produce test forms. This mechanism (i.e., random selection from a large pool) produces an individualized test for each student (or possibly for each class of students) and minimizes the problem of cheating in an individualized instruction environment.

2.1.2 Providing feedback to students is an essential feature of a CMI environment. Because students are working on

their own individualized programs at their own rates, feedback is more critical than in group-paced instruction. This feedback shall indicate the test items and review/remedial instruction required (diagnostic testing capability). The feedback shall occur in real-time (i.e., the feedback should be produced as the tests are graded and recorded). The feedback shall also indicate the number of attempts to achieve criterion, the elasped time, and the projected time.

2.1.3 The system shall provide evidence of the effectiveness of course segments in terms of group and individual performance data. This capability will allow the general improvement of the instructional effectiveness of the course by identifying inadequate instructional units or media. This feature shall involve the production of reports which show cumulative student responses according to course segments in terms of number of students passing/failing after successive attempts. Test items which have high miss rates will be flagged. The feature shall also produce reports which indicate whether review/remedial instruction prescribed was effective in identifying and eliminating problems for individual students.

2.2 Student Records Component

Information contained in the student records will be used to evaluate the instructional progress of the student, provide feedback on progress, indicate effectiveness of instructional components, and generate individualized learning prescriptions for each student. To meet these needs the system shall include:

a. Biographical information on each student which includes entry-level information, personnel data, and previous job/training experience.

b. Training performance information on objectives mastered including results on each test item administered, number of attempts/trials for each objective, and time required to successfully complete objectives.

c. Report generation of desired information stored in records as required at different levels of course management.

d. Multiple sort capability with real-time response.

2.3 Scheduling Component

The capability to schedule learning activities and resources in the most optimal manner possible is fundamental to any effective system. For the F-16 training system, the schedule must operate at three levels: syllabus, weekly, and daily.

2.3.1 At the syllabus level, it shall be designed to assess the adequacy of the facility for the projected student throughput. Using the inventory of resources and the student record data, it should indicate (a) the training resources available versus those required, (b) training accomplishments versus projected graduation dates, and (c) provide an analysis of individual student progress in terms of dates for segments to be completed.

2.3.2 At the weekly level, the scheduling function shall be designed to assess daily training resources and personnel availability in terms of (a) short-term projected schedules which name specific training events, gunnery ranges, or aircraft and (b) ability to evaluate student progress in terms of predicting where in the course the student will be and whether needed resources will be available at that time.

2.3.3 At the daily level, it shall be designed to incorporate the ability to "fine tune" the training schedule around daily occurrences which generate exceptions to the weekly schedule. This will involve:

a. Ensuring that pilots (IPs and students) comply with command regulations and local constraints regarding prerequisite events, crew rest, medical clearances, and currency prerequisites, and general supervisory considerations.

b. Adjusting daily schedules to allow for missed or unsatisfactory events (i.e., aborts, weather, etc.), and providing necessary notification for rescheduling of affected personnel.

2.4 Inventory Component

The F-16 CMI system shall maintain, on a real-time basis, current inventories and usage records on all training resources in order to detect deficiencies and nonefficient usage. These inventories shall be accessible by the report generation capability of the student records component. Inventories shall be kept on training personnel, facilities, equipment, and supplies.

2.4.1 Personnel shall be inventoried as a training system resource on a long-term and day-to-day availability basis:

a. Long-term tracking shall concern the following information as a minimum: Aircraft qualification, instructor speciality, expected date of full qualification, and proposed rotation date.

b. Short-term availability will be concerned with information on projected leave, days off, and scheduled activities of all personnel.

2.4.2 All training facilities such as classrooms, briefing/conference rooms, and study carrels shall be inventoried. Facilities shall be identified by student capacity, audiovisual capability, time availability, and current status.

a. Student capacity will be based upon the type of training to be accomplished and the media to be employed.

b. Audiovisual capability shall include study room, sound/slide (individual and group), videotape (individual and group), or computer assisted instruction (CAI).

c. Time availability shall indicate the regularly scheduled use of the facility and the duration of that use.

d. Current status should indicate whether the facility is in use, in maintenance, or open.

2.4.3 All training equipment (e.g., simulators) shall be inventoried. This information shall include the hard and flexible schedules for use, daily demands on the equipment, scheduled maintenance, and current status.

2.4.4 All supplies required in the training program shall be inventoried. This includes administrative materials (e.g., paper, pencils, forms), as well as operational supplies (e.g., fuel, ordnance). The inventory must indicate the existing and planned usage and generate reports indicating over- or underuse limits. The status of reorders must also be available to check on late orders.

2.5 Prescriptive Components

Given the learning characteristics of the student and previously mastered skills/tasks, a new instructional task or activity must be prescribed after each test or performance evaluation point. This capability can range from a "canned" prescription in which each event has a fixed activity, to a fully dynamic situation where course performance and resource availability are considered in making the prescription. The F-16 CMI system shall:

a. Generate individual learning prescriptions for each student which includes objectives or tasks to be completed, mastery levels for satisfactory completion of these objectives/tasks, and a timetable for learning activities.

b. Make prescriptions which optimize the utilization of available resources and which account for scheduling changes, or personnel availability.

c. Allow the students to interrogate the system for further information in terms of additional resources or additional instructional activities.

d. Allow students choice of activities, media, or sequencing, where feasible, and record this choice of alternatives.

2.6 Summary of F-16 CMI Specifications

The F-16 CMI system shall consist of five major components, defined in terms of a number of essential features for each component. The testing component shall include functions to grade tests, perform diagnostic testing, and control test security. It shall also provide the capability for student feedback, as well as monitor the instructional effectiveness of the course. The student record component shall include biographic and student performance data base functions, as well as report generation and file sorting capabilities. The scheduling component must be able to schedule at the syllabus, daily and weekly levels. The inventory component shall maintain records on the availability of all training personnel, facilities, equipment, and supplies and also allow projections of resource utilization. Finally, the prescriptive component shall generate individual learning schedules, optimize the utilization of resources, and allow students to interrogate the system for further information, or to exercise choice of alternatives, when possible. These five components provide the minimal CMI support capabilities necessary for the effective management of the F-16 training program and, also, to satisfy the needs analysis completed earlier.

3.0 ANALYSIS OF EXISTING SYSTEMS SUITABLE FOR CMI

A number of existing systems could serve as the basis for the development of a CMI system for the F-16 training program. This section provides a brief functional description of, and examples of program descriptions and input/output (where available) for five such systems: Air Force Operations Resource Management System (AFORMS), Time-shared Interactive Computer Controlled Information Television (TICCIT), Versatile Training System (VTS), Navy CMI, and Advanced Instructional System (AIS). While these are not the only existing systems with the capabilities required to meet the functional specifications for the F-16 CMI system, they are considered the best candidates in terms of cost/benefit considerations. For those systems where sample output or program descriptions are available, the discussion is abbreviated.

3.1 Analysis of Capabilities of AFORMS for CMI

The AFORMS was designed to fill the need for better tracking and monitoring of aircrew training programs. The overall objective of AFORMS is to identify, compile, track, and report functional management information needed to:

1. Support implementation of USAF regulation flight management policies,

2. Provide accurate, timely aircrew data to assist in the determination and reporting of mission capabilities, combat readiness, and aircrew experience, and

3. Ensure ready availability of aircrew information is readily available in formats that allow decisions and accurate tracking of training accomplishments.

It is intended that AFORMS provide an online, interactive and real-time, AF-wide management system with common data bases, reports, and centralized system development/maintenance work while still accommodating the different needs, organizational structures, and existing DP systems of the various AF commands. In addition, it is proposed that current (batch oriented) hardware be used as the basis for the system. Figure 1 outlines the nature of the input/output relationships in AFORMS, as given in the AFORMS functional description document, December 1976.

The initial implementation will provide two major systems to meet three general objectives of AFORMS. These are the resource management and aircrew training management systems. Resource management involves the maintenance of an accurate inventory of assigned resources, project resource availability and utilization, and the documentation of actual resource usage. The primary resources involved are aircrew personnel and aircraft

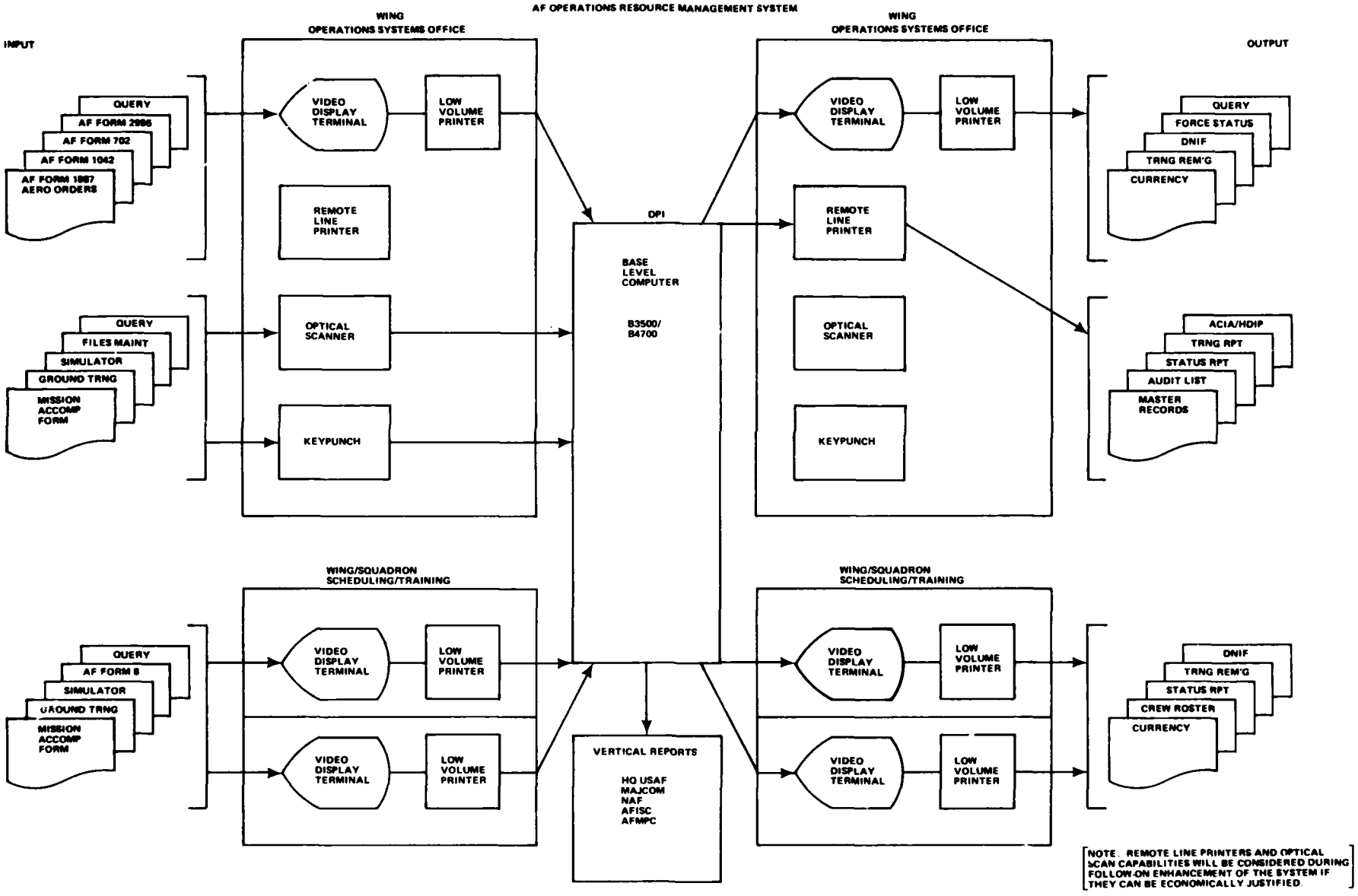


Figure 1. Complete AFORMS System

flying hours. Table 1 summarizes the specific performance requirements necessary for resource management support. Aircrew training management involves the maintenance of an accurate inventory of individuals and crews who require aircrew training, a determination of the specific training required for each individual or crew, and the maintenance of records of the actual training accomplished by each individual or crew. Table 2 summarizes the specific performance requirements required for aircrew training management support. For each of the components given in Tables 1 and 2, there is a corresponding data base involving between 10 and 100 separate data items. There are 23 types of standardized reports generated.

The current form of AFORMS could be used as a basis for a CMI system; however, the present implementation does not contain the fundamental capabilities needed for CMI, i.e., prescription, scheduling, and evaluation functions. Thus it would be necessary to provide functions to generate individualized aircrew training prescriptions and timetables, as well as automatic test grading and diagnostic testing. AFORMS does not have provisions for actual aircrew scheduling (i.e., individual or crews) or facilities for compiling/manipulating historical data bases for student records or resource utilization. It does have the components necessary to generate such schedules or keep student records (i.e., aircraft assignment, continuation training assignment, and continuation training event recording). Building a CMI system using AFORMS requires extending these capabilities. AFORMS does have a report generation mechanism which would be used in the generation of learning prescriptions and evaluation activity.

There are a number of implementation problems with the use of AFORMS for CMI: The date the system will be fully operational is unknown; CMI capabilities will probably have low development priority in AFORMS; and, most importantly, AFORMS is planned to be used on the already saturated base Burroughs 3500 computer which will greatly inhibit the required real-time response.

3.2 Analysis of TICCIT CMI Capabilities

TICCIT is a fully operational, interactive training system owned by Hazeltine Corporation and developed jointly by MITRE and Brigham Young University. TICCIT is a stand-alone minicomputer-based system supporting up to 128 terminals per system. TICCIT technology is based upon color television displays of intermixed alpha/numerics, stored graphics, motion video, and random access audio, with user response via keyboard and light pen. TICCIT facilities include a complete range of authoring features, data entry aids, data base management capabilities, and record acquisition/analysis utilities. Although TICCIT is primarily designed for CAI activities, the facilities are suitable for CMI support.

Table 1

Performance Requirements for Resource Management Support in AFORMS

Component	Capabilities
- Personnel Inventory and Status	Store and maintain identification and status of all AF personnel.
- Aviation Career Incentive Act	Store and maintain data necessary to record accumulated months of flying duty.
- Aircrew Flying Experience	Store and maintain qualification data and total flying/sortie hours for all aircraft types.
- Crew Inventory and Status	Store and maintain identification and status for each integral crew.
- Aeronautical Orders	Generate and display/print Aeronautical Orders.
- Data Transfer for Change of Station	Transfer all identification, and status data for any personnel transferred.
- Management Support During Deployment	Transfer all identification and status data for personnel deployed for flight duty.
- Flying Hour Allocations	Store and maintain data of allocation of all aircraft types.
- Military Personnel Authorizations	Store and maintain authorization and tour type data.
- Reserve Personnel Authorizations	Store and maintain authorization and tour type data.
- Inventory and Status of Personnel	Store and maintain identification and status of all personnel on active flying status.

Table 2

Performance Requirements for
Aircrew Training Management Support in AFORMS

Component	Capabilities
- Training Requirements Management	Store and maintain training event description and requirements tables for all types of aircraft, crew positions, mission types and proficiency levels.
- Aircraft Assignment for Continuation	Store and maintain identification and status data for combination of all aircraft and crew position types required.
- Continuation Training Assignment (Individual)	Store and maintain identification and status for each continuation training plan an individual is required to complete.
- Continuation Training Event Recording (Individual)	Store and maintain identification, requirement, and summary accomplishment data required for all individuals.
- Aircraft Assignment for Continuation Training (Crew)	Store and maintain identification and status for each type aircarft in terms of crew requirements.
- Continuation Training Assignment (Crew)	Store and maintain identification and status data for each type aircraft in terms of crew requirements.
- Continuation Training Event Recording (Crew)	Store and maintain identification, requirement, and summary accomplishment data required for all crews.
- Aircraft Assignment for Qualification Training (Individual)	Store and maintain identification and status for combinations of aircraft and crew positions required for qualification training plans.
- Qualification Training Assignment (Individual)	Store and maintain identification and status of individual assignments for qualification training plans.

Table 2 (continued)

Component	Capabilities
- Qualification Training Event Recording (Individual)	Store and maintain identification, requirement and summary accomplishment data for each event individuals must perform in qualification training.
- Ground Training Assignment	Store and maintain identification and status data for each ground training plan.
- Ground Training Event Recording	Store and maintain identification, requirement, and summary accomplishment data for each event individuals must perform in ground training.

The TICCIT software system includes a registration package which permits the creation of an identification number and password, assignment of an authorization mode/level (e.g., student, instructor), sorting of the student's name into an online user directory, and the modification or deletion of all registration information. TICCIT software includes capabilities to construct, alter, and deliver tests, either online or offline, as well as automatic test analysis and grading features. Controls on test security, such as random selection of test items from an item pool are available in the software. Diagnostic testing of a limited nature is also possible. In general, TICCIT allows considerably more sophisticated testing than the usual multiple choice/mark sense grading characteristic of other systems.

All student interactions may be recorded automatically, allowing the tracking of any individual student (on a segment-by-segment or response-by-response basis) or any group of students.

A file sorting capability allows the manipulation of student data according to any or all fields in the records. Report generation capabilities allow the automatic production of reports on test statistics (e.g., item analyses), terminal usage, and student performance statistics. The graphics capability of TICCIT also permits the online monitoring of student progress or resource usage data using color-coded charts, graphics or block diagrams. TICCIT software has a built in "advisor" feature which would be suitable for the prescriptive capabilities required in CMI with minor adaptions. The software also has built-in features for providing students with feedback and helps which would be useful in the prescriptive function of CMI.

From a CMI point of view, the TICCIT system needs enhancement in the capabilities for scheduling and inventory. The features needed for producing individual timetables or equipment schedules, or for projecting resource needs/usage, are limited in the standard TICCIT software system, although the data base management and report generation components which do exist could be modified to encompass these functions. Examples of TICCIT program descriptions and sample output are given in Appendix A.

3.3 Analysis of VTS CMI Capabilities

VTS is a training support system oriented toward aircraft maintenance training which encompasses a range of CMI and Personnel Qualification Statements (PQS) functions. It is a standard Navy training device (cog. 20 #11869 and 11869A) and is also used in an Army training application at Fort Sill, Oklahoma.

The capabilities for VTS when fully implemented are shown in Figure 2. These include the following functions:

1. Determine and select the best possible billet for each person based on their individual capabilities, prior experience, and training.

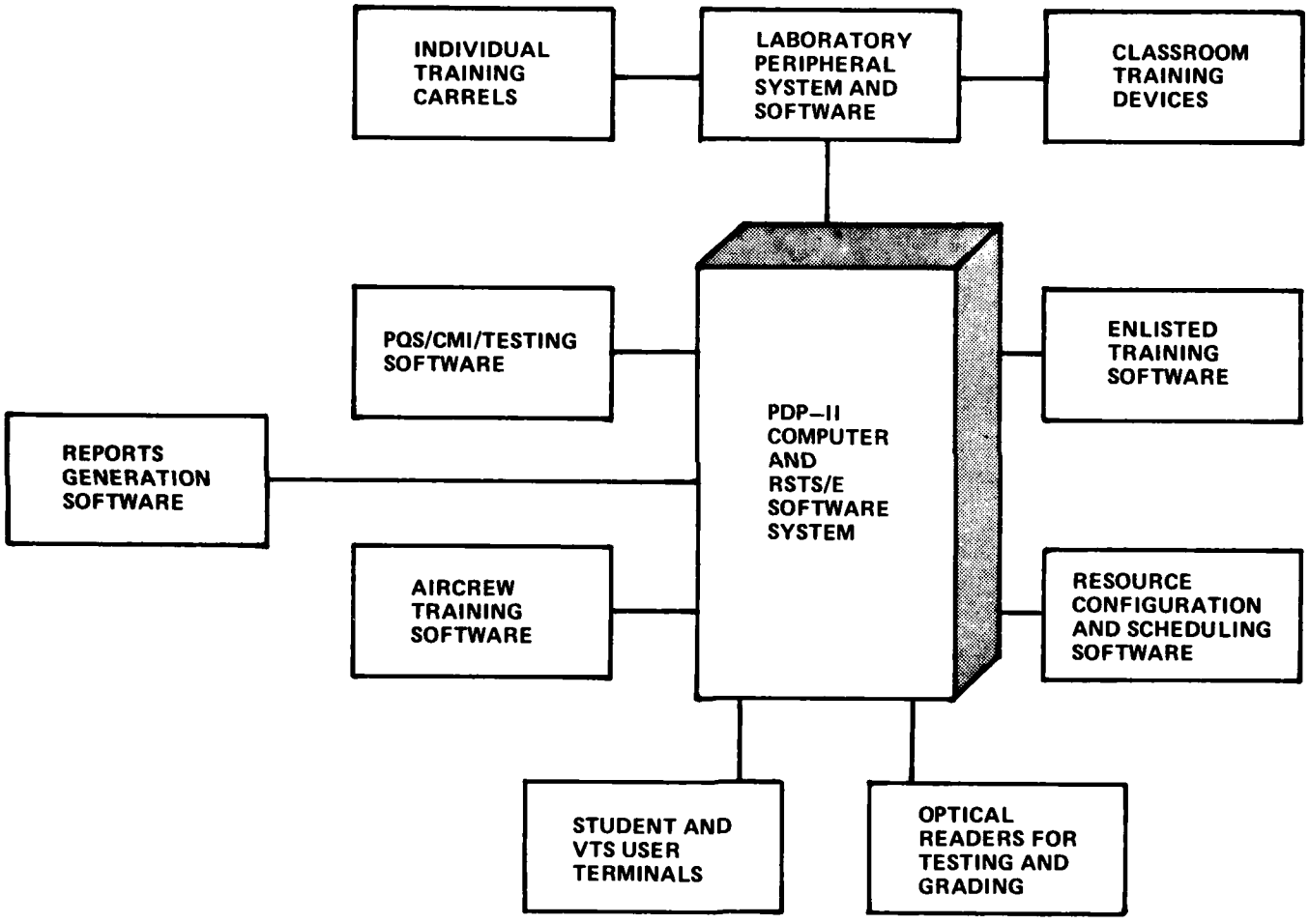


Figure 2. Complete Versatile Training System (VTS)

2. Tailor an individual's training by comprehensive testing (i.e., diagnostic, pretesting, and posttesting), individualized prescription, and path specification.

3. Provide individualized instruction under ISD guidelines.

4. Enable a course manager to author, edit, review, and update training materials online.

5. Provide software which will enable an instructor to design, update, monitor, and control trainers/simulators in a time-shared, high-level language.

6. Schedule training resources (aircraft, simulators, maintenance trainers, personnel, etc.) to meet total training requirements and priorities.

7. Schedule training while holding consumption of resources (personnel, training equipment, time, and material) to a minimum.

8. Provide instructor training coordinators, quota control personnel, and supervisors with current training progress and future training needs.

9. Provide online quota control capabilities required to support officer and enlisted personnel training for all operational squadrons.

10. Permit consideration of the effect of a decision in advance by supplying complete, accurate, and timely training data for use in the planning and decision-making processes.

11. Eliminate from the planning and decision-making processes the problems associated with the use of inconsistent and incomplete training data by providing a means of preparing and presenting training information in a uniform manner.

12. Merge resource and production data to produce significant measures of training performance, facilitate control of costs, and facilitate training decisions with minimum processing of data.

The fully implemented VTS system will consist of five major software components:

3.3.1 Enlisted Training Software. The enlisted training software determines enlisted billets which are vacant within the operational squadrons, or soon will be, and matches an individual by background and training to a specific billet. After billet selection is complete, the enlisted training software, in conjunction with the resource configuration and scheduling software,

generates a training program to qualify the person for the billet, and generates the necessary forms to assign the person to formal training. As the trainee progresses through training, the CMI software grades him or her, records the results, and provides the necessary prescription to enable the trainee to eliminate deficiencies and continue training. The enlisted training software then produces completion letters and other letters, forms, and reports required to coordinate training between the various training units. The enlisted training software also generates student rosters, rating sheets, and other documentation records, such as special training reports and exception reports.

3.3.2 CMI/PQS/Testing Software. The CMI/PQS/testing software will accomplish both online and offline diagnostic and measurement testing functions in all areas of VTS activity. This software will grade tests, maintain statistical data, determine test validity, indicate testing trends, and produce reports relative to these functions. Software is supplied with which lessonware can be added, updated, etc., according to users' needs. Lessonware will be introduced into the VTS in a hierarchical manner to accommodate ISD. Based on such parameters as cost effectiveness, equipment and instructor availability, billet criticality, time constraints, and the extent of training required, the CMI software will schedule an individual's training within ISD guidelines. The training will be broken down to the learning objective level, and the CMI software will test how well the student has learned each objective by means of online tests. If the tests indicate a need, the software will prescribe remediation or will let the student begin work on the next learning objective. The CMI software will also generate statistics which grade each student, the instructor, or an entire class, determine the validity of test questions, and check other relevant parameters.

3.3.3 Resource Configuration and Scheduling (RCAS) Software. The RCAS software will interact with other VTS software to schedule training resources in accordance with training needs. The training resources would include aircraft, simulators, equipment, classrooms, instructors, scheduled classes, etc. RCAS will monitor the status of resources to help ensure that equipment is available and operative when needed and is properly configured. This aircraft might also be made available by RCAS software to an aircraft maintenance class. Data will be collected by RCAS software concerning present and future resource requirements in order that resources can be effectively managed.

3.3.4 Reports Generation Software. The reports generation software will provide high-volume production of forms, letters, and standardized documents automatically utilizing a keyboard terminal, video monitor, local line printer, and computer. This software will allow the operator to input and display a full page of data on the video screen in a format that is operator selectable. Additions, corrections and/or deletions can be made online and the page proofread and fully formatted before being automat-

ically typed or dumped by the local line printer or highspeed printer.

3.3.5 Aircrew Training Software. The aircrew training software prepares an individualized training program for each aircrew member after comparing his training history with a standard training syllabus. This syllabus consists of a list of events (tasks) the student is expected to perform in an accurate and timely manner. The software schedules training in those tasks in which the student is deficient and predicts a training completion date. To make efficient use of training resources, the aircrew training software interacts with the RCAS software which has information regarding resource availability and status. As the student progresses in the training cycle, student and class progress reports are prepared by the aircrew training software, and the CMI software analyzes the work, produces grades, and generates prescriptions to allow the student to eliminate deficiencies and continue on to the next event. In this manner, the aircrew member's training is directed and monitored by the software until completion, at which time completion forms are generated. In addition, aircrew training software performs long-term trend analysis to spotlight deficiencies in the training program itself, in order that the program can be updated and optimized.

Clearly the fully implemented VTS system will provide a comprehensive set of CMI capabilities, far more than are required for the F-16 environment. Thus the problem with VTS is not one of enhancing or adapting a system for CMI functions, but rather of selecting the specific components needed for the F-16 system.

3.4 Analysis of Navy CMI System Capabilities

The Navy CMI system was developed in 1968 by the Navy Personnel Research and Development Center in Memphis, Tennessee. At present, it provides daily instructional management at four different training centers for more than 6,000 students in nine different courses. It is expected that, when fully implemented, it will manage about 13,000 to 15,000 students in 24 courses. The Navy CMI system encompasses capabilities for automated test grading, student record collection, report generation and prescription generation.

Testing capabilities involve four types of test: progress tests, remedial tests, unit posttests, and performance tests. Progress tests are self-checked tests which the student can take as soon as desired. These tests are not used as a basis for grade assignment but for student self assessment. Remedial tests are diagnostic tools which are tied into the amount of remedial instruction available for a particular unit. They prescribe specific review/remedial instruction, tests, or activities. Unit posttests are provided as evaluative tools in terms of course improvement and student retention measurement. Performance tests

are intended to be used to assign grades and evaluate student progress.

Optically scored answer sheets are used for the remedial tests, posttests, and performance tests. After the answer sheets are graded, the system tells the student which items were missed and produces feedback in the form of a remedial study plan or test assignment. (Alternate test forms are used to minimize the problem of cheating.) The performance data collected from the tests is accumulated in a response history file for each student and used to generate test item analysis reports and a daily student progress report. The system also produces reports which summarize student throughput in terms of number of graduates or attritions, their total time on the course, grade levels achieved, prospective job assignment codes, etc.

With respect to the F-16 CMI context, the Navy CMI would seem to provide at least the minimum level of support required in the functional specifications. The system does appear to have adequate test grading, student record collection, and diagnostic testing capabilities. The report generation and prescriptive capabilities are also adequate, although there is a need for additional facilities in these areas. The system is weak in terms of inventory and resource scheduling capabilities. Furthermore, the system technology is relatively inefficiently used (i.e., batch and card oriented), and experience has shown that it is difficult to make modifications within the system environment.

Examples of input forms, individual learning prescriptions, and output reports for the Navy CMI system are given in Appendix B.

3.5 Analysis of AIS for CMI

The AIS is a CMI system developed at Lowry Air Force Base by the Human Resources Laboratory and McDonnell Douglas. While it is primarily designed as an operational type of system, it is also intended to provide research and development capability. AIS is still in the prototype/experimental phase and documentation is scarce; however, because of its potential relevance, a brief description is included.

AIS provides capabilities for:

1. Individual preassessment/diagnostic testing.
2. Individual progress predictions and management.
3. Individual instructional assignments.
4. Online test scoring.
5. Automatic resource tracking and allocation.

6. Automatic data storage and report generation.

AIS is a real-time system based upon a large mainframe (CDC Cyber) with capacity to support up to 50 CMI terminals. Each CMI terminal will consist of plasma-type cathode ray tube (CRT), an optical mark-sensing reader, a thermal printer, and a minicomputer-based controller. AIS will use the CAMIL language for authoring and has additional file handling software providing management information support.

Because documentation on AIS is sparse it is difficult to properly assess its current suitability for the F-16 CMI environment. It appears that AIS will have all of the capabilities identified in the functional specification, plus additional research capabilities which will not be specifically needed in the F-16 environment.

4.0 COST BENEFIT ANALYSIS

4.1 General Cost Benefits for F-16 Environment

A CMI system can result in a number of training benefits, many of which involve potential cost savings. Whether or not these benefits will produce cost savings is dependent upon the particular characteristics of the training environment and the possibility of modifying the present environment to allow the cost savings to be realized. In other words, the benefits resulting from CMI will generally apply to all training contexts; however, they will not necessarily result in cost savings for every instructional situation.

Some of the potential benefits of CMI applicable to the F-16 training context are:

(a) Time savings. A major benefit is the possibility of reducing the amount of training time required through individualized instruction. With all students progressing at their own rates, the faster students can finish sooner and the slower students do not hold up the others. Since training time typically means lost on-the-job time, this time savings translates into cost savings. The Navy CMI system reduced course lengths by 46.8 percent resulting in an annual savings for FY 75 of more than $10 million in student salaries. AIS projects a reduction of 40 percent in course lengths resulting in a savings of 645 student man-years. This saved time can mean higher student throughput.

(b) Effective utilization. The effective utilization of instructional resources (e.g., instructors, media), training equipment (e.g., simulators), or facilities (e.g., classrooms) is a major benefit of CMI by virtue of the scheduling and inventory components. These benefits can mean cost savings due to the more efficient use of resources and the reduction of timetabling mix-ups, student/instructor idle time, or overloaded/underused equipment or facilities. For example, the Navy CMI system has reduced the training support personnel needed by 23 percent for a savings of $1.6 million in FY 75, as well as increasing the instructor to student ratio.

(c) Quality control. CMI tends to improve the quality control of a training system by virtue of providing closer and more exact knowledge of student progress. It is possible to diagnose student problems sooner and also to detect when a student has successfully mastered a skill and hence is ready to progress to another task. This benefit can mean cost savings in those cases where inadequate monitoring of student progress results in student failure (and, therefore, the need for review or retraining). The consequences of inadequate quality control in the operation of powerful and expensive weapon systems are rather poignant (e.g., the cost of a destroyed F-16 aircraft). The Navy CMI system has demonstrated two concrete effects of increased quality

control; one is higher performance levels on exams, the other is lower student attrition. The latter factor saves money in terms of reduced waste of instructor time and resource utilization.

(d) Standardization. CMI contributes to the standardization of a training system insofar as the instructional materials must be modularized and the resources/equipment/facilities are part of a structured scheduling and inventory data base linked to the instructional tasks/objectives. Thus, even though the components of a CMI system (instructors, facilities, equipment) may undergo change and replacement, the system itself remains the same. This type of standardization of a training situation can result in cost savings in terms of the time required to learn or modify the training system. Furthermore, this type of standardization reduces the instructor-dependent variability of a training program, particularly in the testing aspects.

(e) Flexibility. In addition to the standardization of the training situation obtained through CMI, a degree of flexibility is also achieved. Because all activities are in terms of instructional tasks and skills taught, it is possible to replace resources/equipment which are obsolete, broken, missing/lost, etc., without a major reorganization of the system. This could be a cost savings in terms of reduced system development or maintenance time/expenses.

(f) Field deployability. Via telecommunications, it is possible to conduct CMI-based training at sites other than the main training center. For example, the Navy has conduced CMI at sea via satellite transmission from land-based training sites. The capability to train personnel in the field rather than remove them for training activities could mean a cost savings in terms of transportation and logistics support.

(g) Expandibility. Because the system is standardized, it is possible to rapidly increase the number of student positions while eliminating (or minimizing) the need to train additional managers or add additional resources. With the installation of the appropriate hardware, it is possible to completely duplicate a training program at a new site with minimal additional resources. Thus expanding a CMI system to handle more students/sites tends to decrease operating costs per student rather than increase them.

4.2 Specific Cost Considerations for F-16 Environment

Because the F-16 training program has not been implemented yet and is still in a state of flux, critical data needed to generate exact cost estimates (e.g., number of students, instructors, objectives, simulators, media, training sites) is either unavailable or unreliable. Ideally one would use data on student throughput, performance levels, resource utilization or instructor/student ratios with existing instructional strategies

and management, and compute the cost savings resulting from individualized instruction and computer management. Thus in the present case it will be necessary to use data from the F-4 and F-15 training programs and extrapolate it to the F-16 program.

Table 3 provides such data which will be used in this section. These numbers are estimates made by the F-4 and F-15 Operations Training Development (OTD) teams and will vary somewhat with circumstances and assumptions.

The predominant cost savings which result from CMI systems in military and industrial settings are the saved student and instructor salaries resulting from reduced training time produced by individualization. For example, in the Navy CMI experience, a course time reduction of 30 percent was the objective. In fact, an actual reduction of 46 percent in course duration was achieved. In the F-16 environment, the effects of time savings are not likely to be quite as dramatic because of the number of simulation sessions and flight sorties which prevent much compression of the training schedule. Each simulator session or flight sortie requires briefing/debriefing, associated academics time, and aircraft configuration/scheduling. However, the duration of most academic instruction can be reduced by individualized scheduling. Given an amount of academic instruction comparable to F-4/F-15 and a similar instructional organization, an average 10 percent time reduction would appear reasonable. This translates into savings of about two weeks per course or approximately 25 student full-time equivalent (FTE) salaries for the training period.

The online test grading and student records capabilities of the CMI system will amount to further time savings. Every test simulator session and flight sortie requires time to grade and record scores and provide the student with the results. The F-4 training program results in 131 evaluation situations per course (across all instructional activities); the F-16 environment is anticipated to have about 200. Each of these evaluations takes from 10 to 30 minutes to complete properly for each of approximately 250 students. Assuming an average of 20 minutes per evaluation, this amounts to a total of 17,666 hours of instructor time per course. (This calculation does not assume that instructors are actually doing this, but that this is the amount of time which should be spent on this evaluation/data recording/prescriptive activity.) Consequently, the automatic grading capability alone could save more than 10 man-years of instructor time per course. Furthermore, this is a conservative estimate because the student records facility means that routine reports and special inquiries can be produced immediately without lengthy and time-consuming efforts on the part of instructors or support personnel.

With the automated support of the CMI recommended in this report, the number of scheduling personnel required will be reduced, while speed and efficiency will be greatly increased.

Table 3. Data on F4/F15 Training Programs

Courses	F-4 Instr. Upgrade "I" Pilot	F-4 Instr. Upgrade "I" WSO	F-4 Pilot (UPT/FLIT) B	F-4 Pilot FAIP C	F-4 WSO B00W	F-4 Previous Experience TX	ARF F-4 Guard	F-15 "TX"	F-15 "B"
Flights Simulators & Trainers ACAD + AV	36 (25) 41.5 97	12 39 107	49 65 208.5	40 58 208.5	26 70.5 225	18 16 9 31 29 24 133.5	13 13 14 24 24 36.5 36.5 113.5 111.5	21 35 72	41 56 103.5
Tests	11		17	16	15(+2 labs)	3	3	3	6
Length Training Days	49		95	75	71	31	26	43	80
No. Students/year	110		(VN-1200 max) 200 pilots 200 WSO		100		170	50	200
No. Students/Class	12		12 6 - 22		8 4 - 12	12 2 - 20	8 6-10		
No. Training Bases Training Squadron;Base	4 (1/2)		(4/9)		(3/4-5)	(1/4)	(2/2)	1 2 (4)	1
Admin Support	4-6 Squadron								
Schedule Support Wing -- Squadron-- Acad.--	2/1 2/2 2/2 2/2								3/2 2/2 1/4
Academics Instr. (T+S)	6-20+ per base								4 IP 1 Enlist.
IP's Assgn Attached	8-16/Squadron 8/2-16/2								12/2 8/2

Note : Estimates of real numbers by F-4 and F-15 ISD teams vary widely with circumstances and assumptions. Figures here are generally accepted estimates by those teams.

Manual scheduling methods are very limited in terms of the number of elements which can be simultaneously scheduled, the number of scheduling variables which can be accounted for, and the time it takes to generate original and revised schedules. It is a reasonable estimate that a CMI system with the type of scheduling capabilities recommended could reduce the administrative personnel requirements by 50 percent. For the purpose of this study, a conservative estimate of one-third time savings will be used. Using the F-4 and F-15 data as a guideline, it is estimated that each F-16 squadron (three squadrons per wing; one wing per base) will require two scheduling personnel for flight and simulation sorties and two scheduling personnel for academic instruction. Scheduling activities are half-time activities only. Thus, this amounts to a total of six scheduling personnel per wing per base. Thus a conservative savings of two scheduling assistants per base can be achieved, even though the scheduling process will be more efficient and operate under real-time turnaround.

It should be pointed out that the F-16 training program has very sophisticated information and data requirements. This is a result of employing a mastery model of instruction, criterion-referenced objectives (CROs), and the generation of competency profiles for student performance. This means that diagnostic testing and student "recycling" (review or remediation) will be necessary. It will be absolutely essential that the data recording and report generation capabilities can meet these sophisticated demands. Thus, if this management was to be done manually, the F-16 program would need considerably more administrative support personnel than the F-4/F-15 programs (approximately six per squadron). A conservative estimate would be a doubling of needed personnel (i.e., eight to 10 per squadron). However, CMI systems typically reduce the number of support personnel required; the Navy CMI system produced a 70 percent savings. Thus, CMI support of data processing will amount to at least five fewer FTE administrative personnel per squadron or 15 fewer per base.

To summarize, this section has discussed the specific cost savings for the F-16 training program which can be anticipated through the use of CMI. This includes reduction of two weeks per course duration, or 25 student salaries for the training period, 10 man-years of instructor time per course due to automatic test grading and student records, and 17 full-time personnel in the area of scheduling and administrative support. All of these estimates are based upon conservative assumptions. Furthermore, there are additional expected benefits of CMI, such as greater student throughput and hence greater combat readiness, improved performance levels and reduced attrition, and improved resource utilization which cannot be easily captured in cost figures but which will ultimately result in cost savings in the F-16 training program.

5.0 CONCLUSIONS AND RECOMMENDATIONS

It is the conclusion of this study that the F-16 training system must have CMI support if it is to function at a high level of efficiency. This includes maximal student throughput, maximal utilization of instructional resources, high performance level and low failure rates, and, ultimately, maximal combat effectiveness. In addition, it is felt that a CMI system is essential for satisfying the needs of the total training management system (TMS). These include standardization, flexibility, self-monitoring, high reliability, responsiveness, problem diagnosis/detection, and large-scale data base manipulation.

The preceding sections of this report have provided the functional specifications of the CMI system needed for the F-16 training system, a discussion of existing systems relevant to the F-16 environment, and a cost/benefits analysis. This section recommends a specific CMI system in terms of the functional specifications, existing systems survey, and cost/benefits analysis.

Table 4 summarizes the five systems surveyed in terms of the required functional capabilities, their operational status, remote capability, training status, and overall cost. As far as the capabilities are concerned, none of the systems surveyed provide all of the capabilities needed, although VTS, Navy CMI, and AIS come close. Thus, TICCIT and AFORMS would need considerable enhancement to meet all of the F-16 CMI needs. With regard to implementation status, only TICCIT and the Navy CMI system can be considered fully operational. This means that further development time is required before AFORMS, VTS, or AIS could be implemented as an F-16 CMI system. While all five systems allow some sort of teleprocessing or remote access capability, TICCIT and VTS have the virtue of being standard microcomputer-based systems, rather than large time-shared mainframes. Large distributed systems have the advantage of allowing remote terminals and shared central resources. On the other hand, they can also lead to poor system reliability and degraded performance resulting from system saturation. In addition to improved reliability, standalone systems provide greater system security.

AFORMS, TICCIT, VTS, and AIS have all been applied to the domain of aircrew training while the Navy CMI system has not. This is an important consideration insofar as overall development time will be reduced for systems which have been implemented in an aircrew training environment. In addition, VTS is an approved training device.

A further factor has to be considered in evaluating these systems: The F-16 CMI system will be developed in the context of a total management system (TMS). Thus the CMI system must not only provide the overall capability for the management of individualized student programs but it must also interface with other aspects of the TMS, e.g., an author management system, part task trainers, or a CAI application.

Table 4. Comparison of 5 Systems for F-16 CMI Suitability

	AFORMS	TICCIT	VTS	NAVY CMI	AIS
I. FUNCTIONAL CAPABILITIES TESTING					
Auto. Test Grading		X	X	X	X
Diagnostic Testing		X	X	X	X
Test Security		X		X	
Assess. Instr. Effect.		X		X	X
Student Feedback		X	X	X	X
STUDENT RECORDS					
Bibliographic info.	X	X	X	X	X
Report Generation	X	X	X	X	X
Sort Capability		X	X		
SCHEDULING					
Track Schedules	X		X	X	X
Generate Schedules			X	X	X
Project Schedules			X		X
INVENTORY					
Personnel Availability	X		X	X	X
Facilities Available			X		X
Project Resources			X		X
PRESCRIPTIONS					
Individual Prescriptions		X	X	X	X
Resource Prescriptions			X		
II. OPERATIONAL STATUS					
Completely Operational		X		X	
Partially Implemented	X		X		
Prototype					X
III. REMOTE CAPABILITY					
Stand-alone		X	X		
Distributed	X			X	X
IV. TRAINING STATUS					
Aircrew Training	X	X	X		X
Approved Training Device			X		
V. COST					
High (> $1 Million)	X			X	X
Low (< $1 Million)		X	X		

In terms of cost factors, three of the systems (AFORMS, NAVY, CMI, and AIS) require rather expensive hardware and operational support, while the comparable costs for TICCIT and VTS are relatively low. However, in the case of AFORMS, AIS and possibly TICCIT, it can be assumed that the purchase of the hardware will not be necessary, i.e., that it would already be available to the F-16 program. In the case of AIS, it would still be necessary to account for the high cost of the terminals ($10K-$20K per cluster) and telecommunications ($500 per month per cluster).

The costs associated with the software development required varies considerably across the systems. It is estimated that AFORMS will require a rather extensive software effort in terms of the specification, implementation, and documentation of the extensions and modifications needed for the F-16 CMI system, as well as subsequent work to extend the CMI system to encompass the full TMS. The CMI effort alone is estimated to be in the order of three man-years taking at least one year to accomplish. TICCIT development work would be relatively small given the modularized, stable, and well-documented nature of the system. The work required to add the necessary scheduling and inventory components is estimated to be in the order of six man-months of effort. Navy CMI and AIS would need some minor software conversion work. In the case of Navy CMI, it would be a matter of enhancing the scheduling and inventory capabilities; in the case of AIS, it would be necessary to "degrade" the system by reducing the overhead resulting from the research orientation of the system. These efforts for Navy CMI and AIS are estimated to be in the order of three to four man-months. VTS is seen as only requiring slight implementation changes (e.g., changed report headings), all of which would be included in the installation package provided with the system.

To summarize all of these cost considerations, AFORMS, TICCIT, and VTS are within an acceptable cost range based upon the assumption that the hardware for AFORMS and TICCIT is already available. If this assumption is not met, and there are some grounds for believing that a separate system may be needed for F-16, VTS becomes the only satisfactory system in terms of cost factors.

Weighing all of these factors together, it is the recommendation of this study that VTS be implemented as the CMI system needed for the F-16 training program. VTS is able to meet and exceed all of the requirements specified, is relatively inexpensive, is currently in use in aircrew training, and has the advantages of both distributed and stand-alone capabilities. It also is an approved military training device and has interservice usage. Most importantly, VTS is designed to support a training system, rather than just CMI or flight administration activities. This will allow the scope needed for the full-scale F-16 environment.

Appendix A

PROGRAM DESCRIPTIONS/SAMPLES FOR TICCIT

Format: MAKECOURSE

Purpose: To build the permanent data area for a new course, containing information about its structure. Necessary for registration and data reduction for that course. Builds a file called PDAnnnsss where nnn is a 3-digit course number and sss is a 3-digit site code.

Switches: None.

Examples: MAKECOURSE

This initiates the following dialog:
(Entries following each colon (:) are user responses.)
COURSE NUMBER: 101
(Valid course numbers are in the range $0 \leq n \leq 655$.
An empty input terminates the program.)
COURSE MAP MODULE NUMBER (DECIMAL): 4096
(Valid module numbers are in the range $1 \leq n \leq 48000$.
Empty entries are not allowed.)
HIGHEST UNIT NUMBER: 4
(This is the largest number used, not necessarily the number of units in the course. Valid unit numbers are in the range $0 \leq n \leq 30$. An empty entry is equivalent to 0. IMPORTANT: If the TICCIT INTRO UNIT is to be attached to the course, the highest unit number must be increased by 1 to include it.)

START ARROWS ON BOX NUMBER: 4
(When the student first logs on, the blue arrows on the MAP will point to this box. An entry of Ø will cause the arrows to point to the INTRO box.)

UNIT 1 STATUS (R,Y,G,U,K,C,W,N): K
(A permissible entry here is anyone of the letters shown in parenthesis above, the meaning of each letter is: R = Red, Y = Yellow, G = Green, U = Blue, K = Black, C - Cyan, W = White, N = Nonexisting unit.)
HIGHEST LESSON NUMBER IN UNIT: 6
(See description under "HIGHEST UNIT NUMBER:".)
UNIT 2 STATUS (R, Y, G, U, K, C, W, N): N
UNIT 3 STATUS (R, Y, G, U, K, C, W, N): C
HIGHEST LESSON NUMBER IN UNIT: 4
UNIT 4 STATUS (K,Y,G,U,C,W,N): K
HIGHEST LESSON NUMBER IN UNIT: 3
FOR UNIT 1, DO ALL 6 LESSONS EXIST AND IS INITIAL COLOR OF ALL BOXES TO BE BLACK? (Y or N): Y
(To answer Y will set up a unit with 6 lessons existing and each colored black.)

TERMINALUSE

Format: TERMINALUSE logfile$_1$ [...logfile$_N$]

Purpose: To build in the disk file called TERMINALUSE (no extension) a chart showing which terminals were used during the day, how long they were on, and at what times they were on. Only those terminals which were actually used during the day are included.

Switches: /C - also compress the data vertically.

Asterisks: Not permitted.

Example: TERMINALUSE LOG0302. <AM,PM>
This builds a terminal-use chart for the 2nd of March and appends it to the disk file TERMINALUSE. The chart can later be printed out by using the command file called TERMINALS like this:

@ TERMINALS @

BASIC ITEM ANALYSIS REPORT

All practice and test items are gathered into the item data base by using the program called IGATHER. The gathered information can be printed out by running ITEMS. This document describes the report thusly printed out.

The label is of the form ⟨segment #⟩ / ⟨level⟩ / ⟨item #⟩ where level is either E, M, or H (for practice items) or 1, 2, or 3 (for test items).

The columns labeled #1 through #24 represent the occasion codes set during answer processing. UN is #27 which stands for unanticipated. RT represents a "+" in the occasion code field on the answer processing form (as opposed to "-", "?", and "✗"). TOT is the total number of times the item was tried. AV.LAT is the average amount of time answering an item (in seconds). %RT is the percentage of correct answers for this item.

WEEKLY

Format: WEEKLY
WEEKLY input-file

Purpose: To print the weekly student report. By default, the students will be sorted by name.

Switches:
Global: /N - do not rebuild AUSUM.OF
/P - sort by number of lessons passed.
/W - sort by start week.
/T - sort by time-on-line.
/D - sort by last day on system.
/M - sort by tries per lesson (mastery).
/S - suppress student names from report.
/O - suppress student numbers from report
Local: None

Asterisk: Not permitted

Examples:
```
WEEKLY
Enter course/section number:  00701
Enter course/section number: ↵
R

WEEKLY REPORT
R
where REPORT contains the following:
00701
10811
15903
↵
```

Comments: The program will ask for a course-section number which consists of 5 digits, the first 3 being the course number, the last 2 being the section number. After printing the report of that section, it will ask again. The program is terminated by entering only a carriage return.

Only one sort option may be used each time WEEKLY is run.

The file AUSUM.SV must exist to run WEEKLY.

Name: SORT

Format: SORT spec-file error-file input-file output-file

Purpose: To sort the log records in input-file into the order specified by the fields in spec-file and place the results in output-file. If an error is detected in spec-file, the data from spec-file will be moved to error-file and an arrow will be inserted pointing to the mistake. Output devices $LPT or $TTO may be used for error-file.

Switches: None.

Asterisk: Not permitted.

Example: SORT CHAR $TTO LOG0 OUT0
where CHAR contains: DT ST TM

Sort the log records in LOG0 first according to the date, then according to student number, then according to time, and then according to the remaining fields in default sort order. The sorted records are placed in OUT0.

Notes: The input-file must be either random or contiguous, or SORT will not run in a reasonable amount of time. Programs TTOD and SELECT create random files; therefore, the user need not not normally be concerned with file structure.

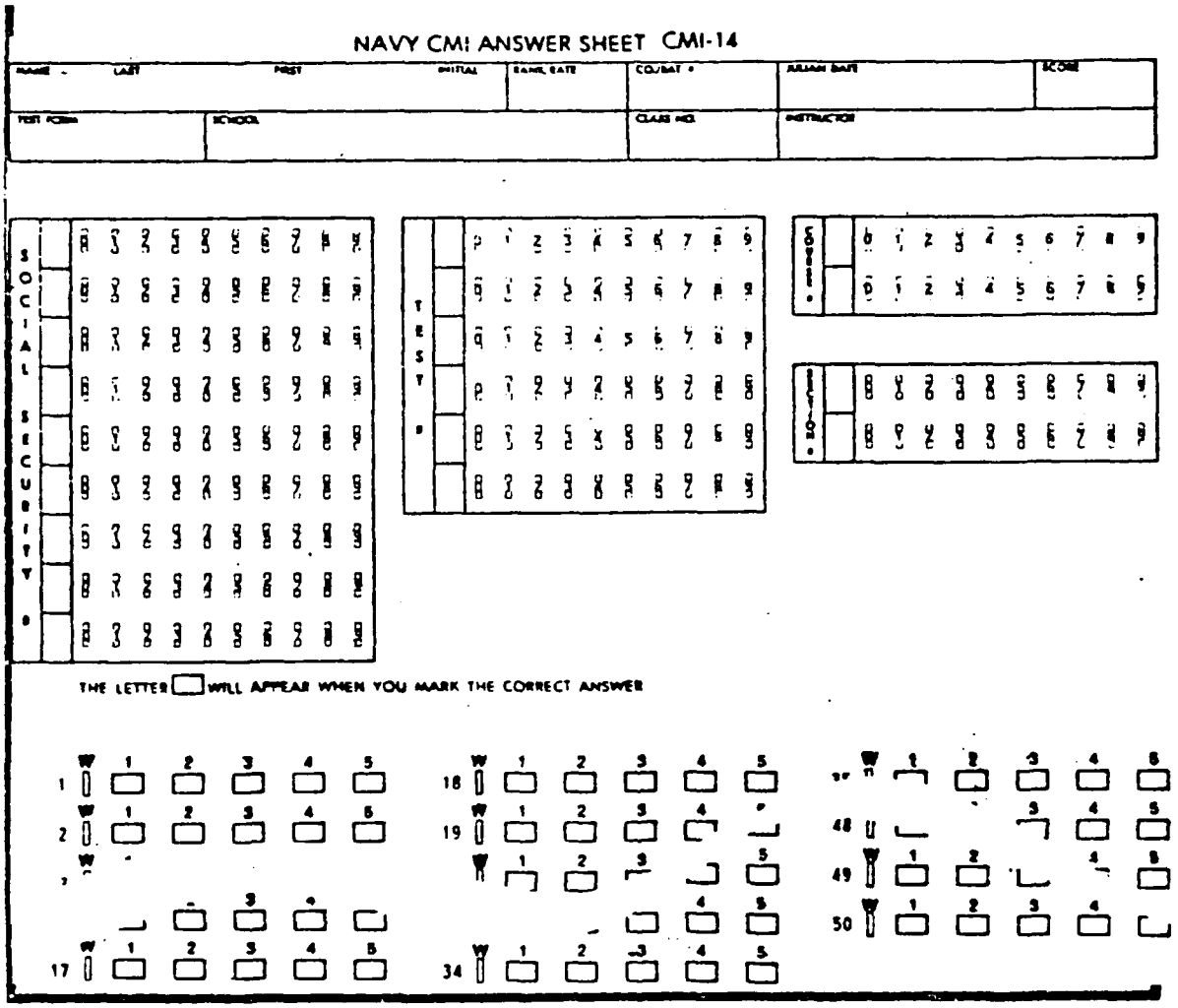
An intermediate temporary file named SORT.TF must exist in the default directory. It may, however, be a link to a file in another directory (e.g. DP4). If SORT.TF is a link, the directory in which the resolution file resides will be automatically initialized. SORT.TF (or its resolution) must be a contiguous file and should be created like this:
CCONT SORT.TF *n* where n is the number of disk sectors to be allocated to SORT.TF. SORT.TF need not be created more than once: it is not deleted by SORT, and can be reused any number of times. A maximum value for n (allocate size for CCONT) may be calculated like this:

n = (input-file size) / 450

SORT executes a program chain to another program SORT2.SV which must also exist in the default directory. A small communication file SORT.CM is created by SORT and may be deleted subsequent to successful execution of SORT.

Appendix B

SAMPLE FORMS AND OUTPUT FROM NAVY CMI SYSTEM


NAVY CMI ANSWER SHEET CMI-14
NAME - LAST FIRST INITIAL
RANK, RATE
COMBAT #
JULIAN DATE
SCORE
TEST FORM
SCHOOL
CLASS NO.
INSTRUCTOR
SOCIAL SECURITY #
TEST #
SEX
AGE
THE LETTER WILL APPEAR WHEN YOU MARK THE CORRECT ANSWER

TO: STUDENT ADMIN DATE: 07 APR 78 DAILY CMI CARREL STATUS REPORT COURSE 069
PGR PARM = 3 TIME: 08:24

COMPLEX ID	L/C	ACTIVE	INACTIVE	VACANT CARRELS	****PROJECTED CARREL VACANCIES (IN DAYS) **** 0	1	2	3	4	5	6	7	8	9
S 0094 342 2	A	23		7	0	0	1	2	0	0	0	0	0	0
	B	23		7	1	0	0	1	0	0	0	0	0	0
	C	23		7	1	2	0	1	0	0	0	0	0	0
	D	22		8	2	1	2	0	0	0	0	0	0	0
	E	22		8	0	0	0	0	0	0	0	0	0	0
	F	23		7	0	2	0	1	0	0	0	0	0	0
	G	0		20	0	0	0	0	0	0	0	0	0	0
	TOTAL	136	0	64	4	5	3	5	0	0	0	0	0	0
S 0094 343 2	A	22		8	0	0	1	0	0	0	0	0	0	0
	B	0		30	0	0	0	0	0	0	0	0	0	0
	C	24		6	0	0	0	1	0	0	0	0	0	0
	D	23		7	1	2	2	1	0	0	0	0	0	0
	E	22		8	0	0	1	0	0	0	0	0	0	0
	F	22		8	1	1	0	0	0	0	0	0	0	0
	G	0		20	0	0	0	0	0	0	0	0	0	0
	TOTAL	113	0	87	2	3	4	2	0	0	0	0	0	0
S 0094 345 2	A	23		7	1	0	0	2	0	0	0	0	0	0
	B	19		11	0	0	0	2	0	0	0	0	0	0
	C	19		11	1	0	0	0	0	0	0	0	0	0
	D	22		8	0	3	0	1	0	0	0	0	0	0
	E	21		9	0	0	0	0	0	0	0	0	0	0
	F	24		6	0	0	0	0	0	0	0	0	0	0
	G	0		20	0	0	0	0	0	0	0	0	0	0
	TOTAL	128	0	72	2	3	0	5	0	0	0	0	0	0
S 0094 342 1	A	20		10	0	0	0	0	0	0	0	0	0	0
	B	23		7	1	0	0	1	0	0	0	0	0	0
	C	23		7	0	1	0	0	0	0	0	0	0	0
	D	23		7	1	0	1	1	0	0	0	0	0	0
	E	24		6	0	0	1	1	0	0	0	0	0	0
	F	22		8	0	0	0	3	0	0	0	0	0	0
	G	0		20	0	0	0	0	0	0	0	0	0	0
	TOTAL	135	0	65	2	1	2	6	0	0	0	0	0	0
S 0094 343 1	A	23		7	0	1	0	0	0	0	0	0	0	0
	B	0		30	0	0	0	0	0	0	0	0	0	0
	C	22		8	1	2	1	0	0	0	0	0	0	0
	D	23		7	1	1	0	0	0	0	0	0	0	0
	E	23		7	1	1	0	0	0	0	0	0	0	0

PGR=3/L7M I=15% D=20%/L2M I=05% D=05%/INC 75%COMP O=50% E=30%/APR= 5DAYS/DPR=20%/EXT*RADD V .5 M2.0 B5.0*DPR X=20% Y=10%/MOD=6.0 HRS

COMPLEX EXTRA DATE: 07 APR 78 TIME: 08:24 DAILY CHI EXTRA STUDY REPORT COURSE: PROGRESS REVIEW

CAR	SSN/SCN NAME	BR COMPLEX	L/C	CUR PAT	MOD	CURRENT MOD AHM LHM	THM PHM	PTC CAL	ADD LOST	AL PL	ADJCT PCT	PERFORMANCE PROG	REQ ADD	THRU LAST MODULE LEARNING RATE / PROGRESS RATE -6	-5	-4	-3	-2	-1	LM	PGR	LTM	L2M	INC	APR	DPR	EXT	MOD
005	S F 7	11		6273	020	2	17	8	12	167	233	25-	4.5	1.36	1.38	1.34	1.32	1.31	1.30	1.28							M	M
	L	500943432	D	E		0	11	46	11	130	182			1.32	1.31	1.27	1.23	1.23	1.20	1.18								
018		11		6358	064	1	2	30	20	191	373	29-	2.8	1.31	1.34	1.31	1.40	1.29	1.26	1.30							M	
	B	500943421	D	I		0	8	52	18	146	287			1.25	1.25	1.22	1.27	1.15	1.11	1.16								
019		11		6272	015	0	4	28	27	211	384	28-	3.3	1.32	1.27	1.26	1.24	1.25	1.34	1.35							M	
		500943432	C	I		0	8	53	25	156	285			1.19	1.14	1.11	1.10	1.10	1.17	1.17								
003		11		6359	016	0	3	27	40	257	424	27-	3.3	1.54	1.50	1.48	1.41	1.41	1.39	1.35							M	
		500943431	B	I		1	12	60	35	190	314			1.31	1.25	1.28	1.19	1.18	1.17	1.14								
018		11		6235	062	0	14	9	9	197	265	59-	8.0	1.60	1.53	1.40	1.35	1.47	1.45	1.52		D		4	D		M
		500943422	F	B		0	13	89	149	129	174			1.58	1.50	1.38	1.33	1.43	1.41	1.45								
021		11		6362	061	0	3	2	9	160	174	30-	6.0	1.45	1.31	1.38	1.40	1.38	1.32	1.31	2			2	X		M
		500943432	D	G		0	3	45	21	121	133			1.45	1.26	1.32	1.33	1.32	1.27	1.24								
009		11		6363	072	0	11	0	29	234	247	72-	6.0	1.44	1.45	1.44	1.46	1.63	1.73	1.76	0	D		5	X		M
	I	500943431	E	G		0	8	65	32	132	140			1.38	1.40	1.39	1.52	1.52	1.55	1.54								
006	S 6	11		6352	014	0	4	24	12	177	323	41-	4.9	1.59	1.57	1.55	1.55	1.56	1.41	1.43				3	M		
		500943451	A	R		0	8	50	18	124	226			1.56	1.51	1.49	1.48	1.45	1.31	1.33								
007	S	11		6273	009	0	1	25	0	79	230	16-	2.2	1.17	.96	.99	1.05	1.09	1.24	1.25				2	M		
	I	500943422	C	E		0	8	25	12	63	184			1.17	.96	.99	1.05	1.09	1.24	1.25								
011	S J	11		6352	021	0	1	5	89	380	412	68-	6.0	1.59	1.54	1.57	1.73	1.74	1.70	1.70				3	X		
	M	R 500943421	B	R		0	17	78	18	223	242			1.15	1.13	1.16	1.32	1.32	1.30	1.30								
013	S	11		6358	006	7	26	73	20	102	568	24-	5.0	.00	.63	.75	1.21	1.65	1.74	1.75				4	D		M
		C 500943451	E	I		0	15	32	18	58	325			.00	.63	.75	1.21	1.65	1.61	1.41								
003		11		6272	012	0	18	32	4	139	351	21-	2.0	1.04	1.03	1.01	.98	.97	1.14	1.22		D			M		M
		A 500943422	C	I		9	9	45	10	113	288			1.00	.99	.96	.94	.93	1.10	1.18		D						
004	S	11		6273	006	2	11	42	12	83	349	9-	2.2	.00	.73	1.40	1.51	1.49	1.34	1.34					M		
	B	500943422	D	E		0	17	25	6	62	260			.00	.73	1.23	1.29	1.27	1.14	1.14								
017	F	11		6269	021	0	14	9	0	214	285	36-	4.8	1.24	1.20	1.19	1.20	1.18	1.20	1.20					M		M
		AR 500943452	B	I		0	13	64	6	178	238			1.24	1.20	1.19	1.20	1.18	1.20	1.20								

PGR=3/L7M I=15% D=20%/L2M I=05% D=05%/INC 75%COMP O=50% E=30%/APR= 5DAYS/DPR=20%/EXT=RADD V .5 M2.0 B5.0*DPR X=20% Y=10%/MOD=6.0 HRS

COMPLEX 500943421 DATE: 07 APR 78 TIME: 08:24 DAILY CMI DEFICIENT PROGRESS REPORT COURSE: 069 PROGRESS REVIEW

CAR L/C	SSN/SCN NAME	BR	TC	ELIG	CDP PAT	***CURRENT MOD*** MOD	AHM LHM	THM PHM	PTC CAL	ADD LOST	AL PL	ADJCT PCT	PROG	REQ ADD	***LEARNING RATE / PROGRESS RATE** -6	-5	-4	-3	-2	-1	LM	P G R	L 7 M	L 2 M	I N C	A P R	D E T	E X T	M O D
018		11	A7	158	6274	007	5	17	57	2	100	461	30-	3.3	1.28	.88	.90	1.04	1.61	1.38	1.45			D		14		M	
E					I		18	20	36	0	69	318			1.28	.88	.90	1.04	1.61	1.38	1.43								
001		11	A7	237	6359	092	0	0	6	21	270	308	17-	3.9	1.29	1.26	1.17	1.17	1.18	1.16	1.16								M
F		RCL			I		0	3	68	28	232	266			1.25	1.21	1.11	1.11	1.10	1.09	1.07								
002		11	A6	161	6274	062	1	6	35	11	172	388	24-	2.2	1.48	1.47	1.34	1.24	1.26	1.24	1.24								M
F		WIG			I		0	14	50	38	138	313			1.43	1.41	1.27	1.17	1.17	1.15	1.17								
007		11	A6	225	6272	007	0	14	49	8	84	392	16-	2.7	.74	1.05	1.38	1.34	1.87	1.76	1.39		D			2		M	
F		TH			J		0	18	33	28	60	282			.74	1.05	1.38	1.34	1.79	1.62	1.27		D						
008		11	A6	116	6352	013	0	13	18	3	148	269	6-	.6	1.22	1.23	1.20	1.15	1.15	1.07	1.06						V		M
F		AEL			R		0	9	46	32	139	253			1.21	1.20	1.17	1.13	1.13	1.05	1.04								
020		32	A7	241	6230	012	0	4	15	36	201	293	60-	6.0	1.85	2.00	1.98	1.83	1.86	1.86	1.88					5	B		
F		RO			B		0	8	53	26	106	156			1.68	1.78	1.75	1.56	1.54	1.54	1.56								

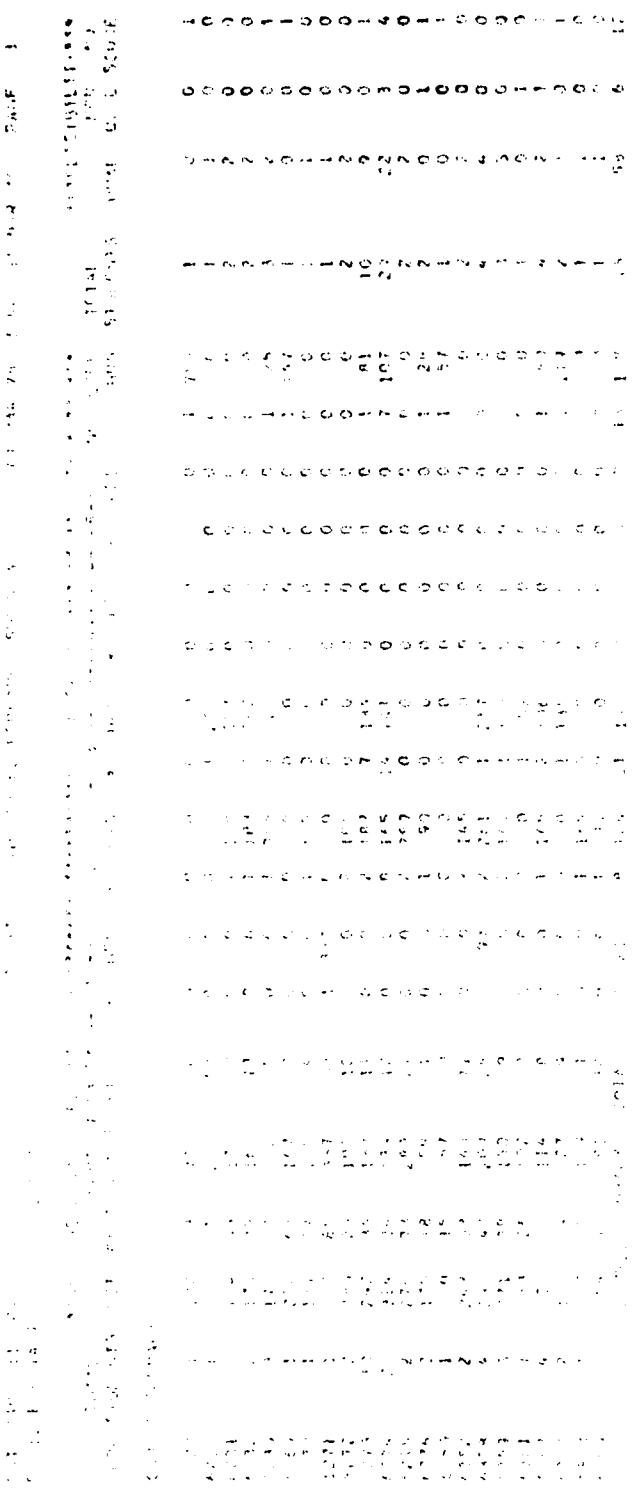
PGR=3/L7M_1=15% D=20%/L2M_1=05% D=05%/INC_75%COMP_0=50% E=30%/APR=_5DAYS/DPR=20%/EXT*RADD V_.5 M2.0 B5.0*DPR_X=20% Y=10%/MOD=6.0 HRS

GRADUATE STUDENT PERFORMANCE SUMMARY

	TOTAL # OF STUDENTS	PCT	CSL DAYS	COMBAT EXPER HOURS	PRIOR	*	HRS	#	HRS	*	HRS	#	HRS	#	HRS	NO SCORE #	HRS	TOTAL STUDENTS	ELIGIBILITY QUAL	NON QUAL	NO SCORE
COURSE SUMMARY																					
6230*	2	274	35	259	0	0	0	0	0	0	0	0	0	0	0	2	369	2	0	0	2
6230	18	153	41	143	0	3	147	9	160	5	185	0	0	0	0	1	236	18	17	0	1
6231	9	154	43	172	7	1	151	5	150	2	247	0	0	0	0	1	147	9	9	0	0
6232	8	157	40	156	2	2	99	4	181	2	165	0	0	0	0	0	0	8	8	0	0
6234	5	142	46	130	10	0	0	4	209	1	150	0	0	0	0	0	0	5	5	0	0
6235	21	174	43	191	19	1	214	11	189	9	192	0	0	0	0	0	0	21	21	0	0
6269	11	264	63	243	7	3	236	3	291	2	182	0	0	0	0	3	265	11	7	1	3
6270	6	151	34	146	1	0	0	4	158	2	123	0	0	0	0	0	0	6	6	0	0
6271	10	273	71	245	7	3	238	5	246	1	392	0	0	0	0	1	294	10	10	0	0
6272	15	270	70	240	4	3	211	12	259	0	0	0	0	0	0	0	0	15	15	0	0
6273	49	211	53	227	11	7	180	25	226	14	242	0	0	0	0	3	273	49	42	5	2
6274	63	204	54	214	7	4	122	29	207	13	230	0	0	0	0	11	262	63	48	4	11
6275	15	271	65	244	4	1	172	10	244	2	367	0	0	0	0	2	275	15	12	1	2
6276	45	133	31	119	2	5	66	11	115	1	51	0	0	0	0	26	124	45	25	1	19
6277	35	153	32	117	3	1	91	15	122	0	0	0	0	0	0	17	119	35	20	1	14
6278	4	231	47	255	11	0	0	2	252	0	0	0	0	0	0	2	258	4	3	0	1
6279	18	229	54	205	6	3	211	10	221	0	0	0	0	0	0	5	167	18	17	0	1
6280	19	231	42	241	7	5	261	9	234	4	223	0	0	0	0	1	234	19	18	0	1
6281	12	279	70	254	11	1	373	6	269	5	283	0	0	0	0	0	0	12	11	1	0
6282	2	271	49	345	44	1	321	1	350	0	0	0	0	0	0	0	0	2	2	0	0
6284	1	47	15	44	0	1	44	0	0	0	0	0	0	0	0	0	0	1	1	0	0
6286	12	137	60	135	1	0	0	2	134	10	135	0	0	0	0	0	0	12	5	7	0
6293	8	133	42	151	4	0	0	5	127	3	192	0	0	0	0	0	0	8	6	2	0
6295*	1	147	48	157	2	0	0	1	167	0	0	0	0	0	0	0	0	1	0	0	1
6297	1	294	91	293	11	0	0	1	298	0	0	0	0	0	0	0	0	1	1	0	0
6298	5	271	61	237	10	1	271	4	228	0	0	0	0	0	0	0	0	5	5	0	0
6299	5	252	68	251	10	2	256	3	264	0	0	0	0	0	0	0	0	5	5	0	0
6310	1	233	30	272	7	0	0	1	272	0	0	0	0	0	0	0	0	1	1	0	0
6311	3	224	50	193	2	2	197	1	193	0	0	0	0	0	0	0	0	3	3	0	0
6465*	4	272	70	250	4	2	244	2	264	0	0	0	0	0	0	0	0	4	0	0	4
	1	275	151	425	31	0	0	0	0	0	0	0	0	0	0	1	425	1	0	0	1
		*COURSE SUMMARY	TOTAL	56	142	195	204	76	208	0	0	0	0	92	197	409	323	23	63

PFT - GUARD MOUNT
11 APR 78

NAME	SSN	DATE TRAINEE	DATE ENTER	GRP	STATUS	PR	YR	LN	TC	ASVAB SCORES
[illegible]	[illegible]	[illegible]	10 APR 78	6277		H	56	12	B6	00/00/00/58/[illegible]/00/66/55/00/00/00/00
[illegible]	[illegible]	[illegible]	10 APR 78	6274		H	56	12	A7	67/00/[illegible]/56/5[illegible]/00/60/55/54/50/00
[illegible]	[illegible]	[illegible]	10 APR 78	6273		H	53	14	A7	65/00/45/45/49/48/00/64/66/36/48/46/00
[illegible]	[illegible]	[illegible]	10 APR 78	6273		H	56	12	A7	98/00/56/68/[illegible]/65/00/[illegible]/66/66/47/64/00
[illegible]	[illegible]	[illegible]	10 APR 78	6216	A1	[illegible]	59	12	A7	00/00/58/63/54/54/00/50/44/53/42/54/00
[illegible]	[illegible]	[illegible]	10 APR 78	6273		N	59	11	A6	00/00/48/49/53/53/00/[illegible]5/50/54/59/48/00
[illegible]	[illegible]	[illegible]	10 APR 78	6277		H	56	12	B8	00/00/00/70/00/60/00/70/64/00/00/00/00
[illegible]	[illegible]	[illegible]	10 APR 78	6276		H	56	12	A7	92/00/56/64/57/65/00/61/60/64/60/65/00
[illegible]	[illegible]	[illegible]	10 APR 78	6277		H	57	12	A7	92/00/63/58/68/65/00/62/66/62/73/65/00
[illegible]	[illegible]	[illegible]	10 APR 78	6277		S	00	00	A6	00/00/00/00/00/00/00/00/00/00/00/00/00
[illegible]	[illegible]	[illegible]	10 APR 78	6231		H	58	12	A7	75/00/48/[illegible]1/55/59/00/50/64/60/[illegible]/61/00
[illegible]	[illegible]	[illegible]	10 APR 78	6252		H	58	12	A7	75/00/44/51/60/59/00/60/57/64/54/52/00
[illegible]	[illegible]	[illegible]	10 APR 78	6274		H	56	12	A6	47/00/38/44/52/45/00/47/54/62/44/53/00
[illegible]	[illegible]	[illegible]	10 APR 78	6277		H	57	12	B8	00/00/00/65/00/64/00/66/48/00/00/00/00
[illegible]	[illegible]	[illegible]	10 APR 78	6274		H	57	12	A7	62/00/53/51/53/57/00/48/57/49/54/59/00
[illegible]	[illegible]	[illegible]	10 APR 78	6274		H	59	12	A5	92/00/54/50/60/69/00/61/56/54/54/54/00
[illegible]	[illegible]	[illegible]	10 APR 78	6274	[illegible]	H	59	11	A7	40/00/44/31/50/59/00/50/57/55/52/44/00
[illegible]	[illegible]	[illegible]	10 APR 78	6270		H	58	12	A7	88/00/48/[illegible]/59/57/00/56/00/56/62/55/[illegible]



COMPLEX 500943431 DATE: 07 APR 78 DAILY CMI ACCELERATED PROGRESS REPORT COURSE: 049 PROGRESS REVIEW
TIME: 08:24

CAR L/C	SSN/SCN NAME	BR	TC	ELIG	CDP PAT	MOD	CURRENT MOD AHM LHM	THM PHM	PTC CAL	ADD LOST	AL PL	ADJCT PCT	PROG	PERFORMANCE THRU LAST MODULE REQ ADD	-6	-5	-4	-3	-2	-1	LH	P G R	L T H	L 2 M	I N C	A P R	D P R	C X T	M O D
013		11	AT	268	6408	014	0	2	14	0	64	149	37+	.0	.60	.60	.58	.59	.60	.61	.63					01			M
F	L J				1		0	6	23	18	101	237			.60	.60	.58	.59	.60	.61	.63								
017		11	B7	0	6269	007	0	8	25	0	43	202	20+	.0	.32	.56	.65	.70	.53	.62	.68		D	D					M
F	AM				1		0	17	19	18	63	296			.32	.56	.65	.70	.53	.62	.68		D	D					
018		11	A6	153	6274	022	0	13	4	0	256	291	71+	.0	.85	.82	.82	.82	.82	.78	.78					0			M
F	ONY				1		0	14	81	54	327	374			.85	.82	.82	.82	.82	.78	.78								
020		11	B8	0	6277	062	0	8	1	0	40	55	70+	.0	.34	.34	.35	.35	.34	.35	.36					0			M
F	UC				B		0	12	16	18	110	152			.34	.34	.35	.35	.34	.35	.36								
023		11	AT	170	6273	009	0	2	13	0	52	131	36+	.0	.58	.58	.58	.59	.58	.58	.59					0			M
F	NE				E		0	9	22	18	87	222			.58	.58	.58	.59	.58	.58	.59								
024		11	A6	177	6274	062	0	2	15	0	53	145	33+	.0	.52	.54	.57	.59	.59	.59	.61					0			M
F	EL				1		0	9	22	18	86	237			.52	.54	.57	.59	.59	.59	.61								

PGR=3/L7M I=15% D=20%/L2M I=05% D=05%/INC 75%COMP O=50% E=30%/APR= 5DAYS/DPR=20%/EXT*RADD V .5 M2=.0 B3=.0*DPR X=20% Y=10%/MOD=6.0 HRS

RESPONSE HISTORY FILE

[illegible] RESPONSES FOR STUDENT [illegible] PAGE 2

CRS NO.	MOD NO.	TEST NUMBER	START DAY	START HR	END DAY	END HR	TE TIME	RESPONSE DATA LM	RESPONSE DATA AT	RESPONSE DATA CR	MODULE COMPLETION HRS	RESPONSE TEXT
[illegible]	[illegible]	[illegible]	[illegible]	1.4	[illegible]	1.4	.0	99	14	10		42232213344224000000000000000000000000000000000
		[illegible]	[illegible]	1.4	[illegible]	1.7	.3	1	[illegible]	4		42222323044224000000000000000000000000000000000
		[illegible]	[illegible]	1.7	[illegible]	1.9	.2	1	7	4		23232423044224000000000000000000000000000000000
		[illegible]	[illegible]	[illegible]	[illegible]	1.9	.0	1	3	3		01021312 33113
		[illegible]	[illegible]	[illegible]	[illegible]	2.4	.9	1	4	3		14322023044224000000000000000000000000000000000
		[illegible]	[illegible]	2.4	[illegible]	2.4	.1	1	4	2		21132023044224000000000000000000000000000000000
		[illegible]	[illegible]	2.4	[illegible]	2.5	.1	1	3	3		01021 12 33113
	[illegible]										6.5	MODULE COMPLETED
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.4	10.9	1	22	10		43112313412343423124111000000000000000000000000
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3.5	1	23	7		14434343412111411332343000000000000000000000000
		[illegible]	[illegible]	[illegible]	[illegible]	5.0	.1	1	23	6		14434343412111411332343000000000000000000000000
		[illegible]	[illegible]	[illegible]	[illegible]	5.0	.0	1	3	3		0102323230100300221232
		[illegible]	[illegible]	[illegible]	[illegible]	5.4	14.9	2	10	3		32134343412111411332343000000000000000000000000
		[illegible]	[illegible]	[illegible]	[illegible]	5.4	.0	1	3	2		32134343412111411332343000000000000000000000000
	[illegible]										14.9	MODULE COMPLETED
	[illegible]	03/20/78			19:14:26			P				406000 4 0 3454102 885 8 4606920295
		03/22/78			18:26:51			B				406000 4 0 3454103 885 8 8625820295
		[illegible]	[illegible]	[illegible]	[illegible]	4.4	17.0	1	16	9		23343341143213210000000000000000000000000000000
		[illegible]	[illegible]	[illegible]	[illegible]	1.2	8.8	1	16	10		34222333443422120300340000000000000000000000000
		[illegible]	[illegible]	1.2	[illegible]	2.1	.0	1	16	12		22122112324142240000343000000000000000000000000
		[illegible]	[illegible]	2.1	[illegible]	2.2	.1	1	16	4		22122112324142240000343000000000000000000000000
		[illegible]	[illegible]	[illegible]	[illegible]	2.4	.2	1	16	4		22122112441242220000343000000000000000000000000
		[illegible]	[illegible]	2.4	[illegible]	2.4	.0	1	3	3		01011001330131111 23
		[illegible]	[illegible]	2.4	[illegible]	3.5	1.1	1	13	9		33322341222410200000340000000000000000000000000
		[illegible]	[illegible]	[illegible]	[illegible]	3.7	.2	1	13	8		12134143132410200000340000000000000000000000000
		[illegible]	[illegible]	[illegible]	[illegible]	4.9	1.2	1	13	7		11424122414330000000000000000000000000000000000
		[illegible]	[illegible]	[illegible]	[illegible]	.6	1.7	1	3	3		010
	[illegible]										25.2	MODULE COMPLETED
	[illegible]	[illegible]	[illegible]	.6	[illegible]	1.9	1.3	1	45	33		23434241121443111224112332142441231332103421100000
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.1	99	45	33		23434241121443111224112332142441231332103421100000
		[illegible]	[illegible]	2.0	[illegible]	2.4	.4	1	6	3		24244201121443111224112332142441231332103421100000
		[illegible]	[illegible]	2.4	[illegible]	2.5	.1	1	6	4		24131201121443111224112332142441231332103421100000
		[illegible]	[illegible]	[illegible]	[illegible]	2.5	.0	1	3	3		010221 0010332000113001221031330120221023100
		[illegible]	[illegible]	[illegible]	[illegible]	2.6	.6	1	5	4		24142201121443111224112332142441231332103421100000
		[illegible]	[illegible]	[illegible]	[illegible]	2.7	.1	1	5	4		43241201121443111224112332142441231332103421100000
		[illegible]	[illegible]	[illegible]	[illegible]	2.7	.0	1	3	3		010301 0010332000113001221031330120221023100
		[illegible]	[illegible]	[illegible]	[illegible]	2.5	.8	1	4	2		21241001121443111224112332142441231332103421100000
		[illegible]	[illegible]	[illegible]	[illegible]	2.9	.1	1	4	2		21321001121443111224112332142441231332103421100000
		[illegible]	[illegible]	2.9	[illegible]	2.9	.0	1	3	3		010101 0010332000113001221031330120221023100
		[illegible]	[illegible]	[illegible]	[illegible]	3.2	1.2	1	10	8		11241331441443111224112332142441231332103421100000
		[illegible]	[illegible]	[illegible]	[illegible]	3.2	.0	1	10	4		11241331441443111224112332142441231332103421100000
		[illegible]	[illegible]	[illegible]	[illegible]	3.2	.0	1	3	3		0104022033033200011300122103133012022102 3100
		[illegible]	[illegible]	[illegible]	[illegible]	3.3	1.3	1	8	3		31231231441443111224112332142441231332103421100000
		[illegible]	[illegible]	[illegible]	[illegible]	3.3	.0	1	4	3		31231231441443111224112332142441231332103421100000
		[illegible]	[illegible]	[illegible]	[illegible]	3.4	1.4	1	3	1		12131231441443111224112332142441231332103421100000
		[illegible]	[illegible]	[illegible]	[illegible]	3.4	.1	1	3	3		01020120330332000113001221031330120221023100

EXAMPLES OF INDIVIDUAL LEARNING PRESCRIPTIONS

```
-----      TRANSACTION RECEIVED      -----
SYR00 <SSN>  055027

APR 07,'78  11:51  COURSE# 69  COMPLEX 5004-3421  LEARNING CENTER B  CARREL A
<NAME>      <RATING>                    MOD  11      ELAPSED CONTACT TIME
MOD   TEST                          STATEMENT TEXT
                  *** YOU HAVE SUCCESSFULLY COMPLETED MODULE ELEVEN.***
MOD  11  TIMES: PREDICTED   2.32  CONTACT   4.9 (REG    4.7 EXT   0.0 LOST   0
 12  006630  YOUR ASSIGNMENT IS TO STUDY MATERIAL RECEIVED AND TAKE MODULE
             TWELVE MATH TEST. ITEM NUMBER 006630---ESTIMATED COMPLETION
             CO-04:E3-E6
 12  001203  YOUR ASSIGNMENT IS TO STUDY MODULE 12 LESSONS 01 AND 02. AND
             TAKE MODULE 12 TEST ITEM NUMBER 001203  CO-04:C11-D3
                 STUDENT'S PREDICTED TIME FOR MOD  12 IS   9.39
```

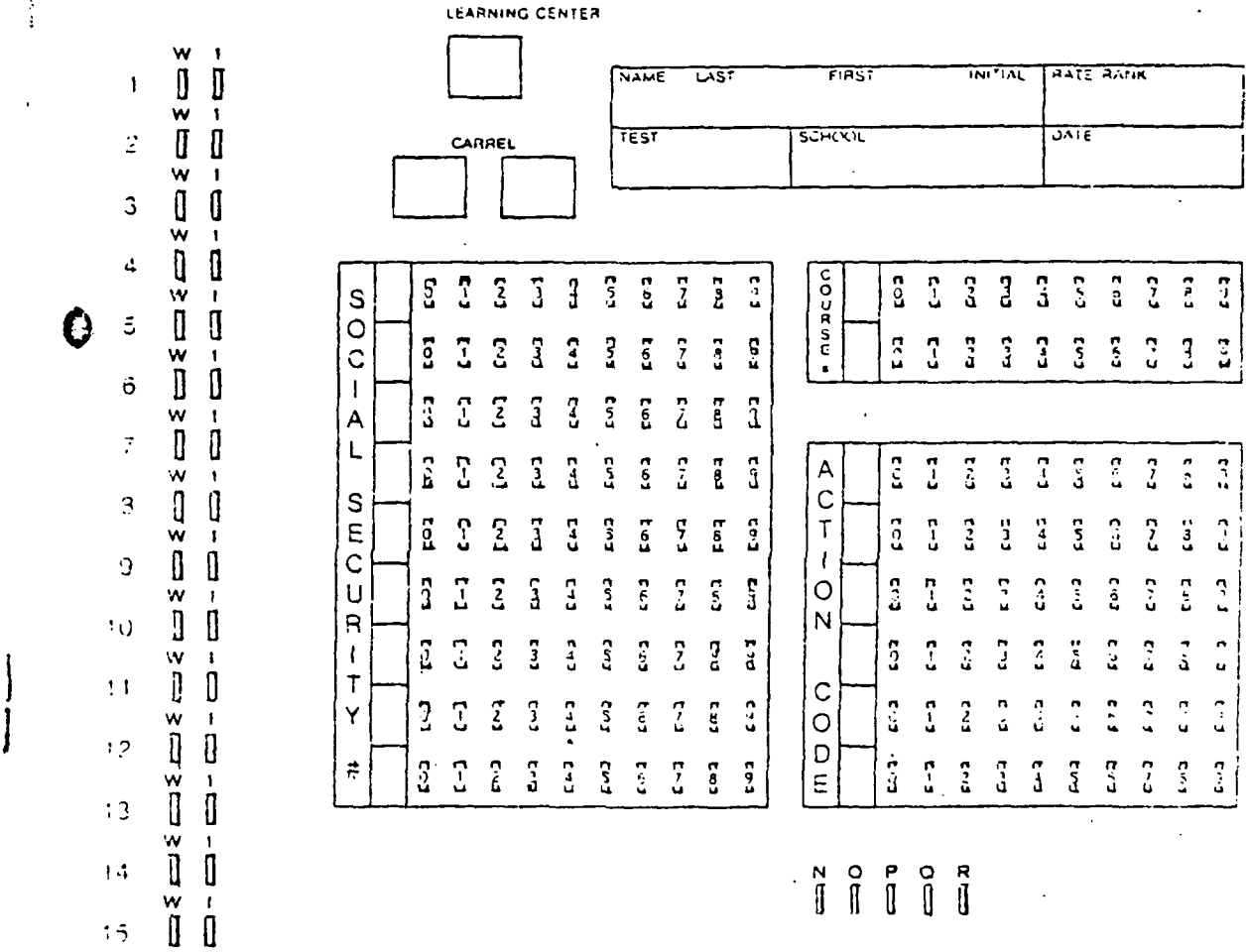
```
-----      TRANSACTION RECEIVED      -----
SYR00 <SSN>  012804

APR 07,'78  11:51  COURSE# 69  COMPLEX 5004-3421  LEARNING CENTER B  CARREL A
<NAME>      <RATING>                    MOD  21      ELAPSED CONTACT TIME
INCORRECT:  01,02,03

MOD   TEST                          STATEMENT TEXT
             SEE YOUR LEARNING SUPERVISOR ABOUT PROBLEMS IN THIS LESSON.
 21  012431  LEARNING SUPERVISOR INPUT. ADMIN FORM REQUIRED.
```

```
-----      TRANSACTION RECEIVED      -----
SYR00 <SSN>  012301
APR 07,'78  11:51  COURSE# 69  COMPLEX 5004-3-21  LEARNING CENTER B  CARREL A
<NAME>      <RATING>                    MOD  21      ELAPSED CONTACT TIME
MOD   TEST                          STATEMENT TEXT
NO ASSIGNMENTS GIVEN FROM 012301
CONTINUE WITH PRIOR ASSIGNMENTS
```

NAVY CMI ADMINISTRATIVE FORM



Name: SORT (Continued)

Notes: (Continued)

Following are the fields allowed in the sort characteristic file together with their mnemonics which must be used. They are given in default sort order. After sorting on the given fields, SORT will then sort on the remaining fields in default sort order.

Field	Mnemonic
Date	DT
Student number	ST
Time	TM
Course	CR
Unit	UN
Lesson	LS
Segment	SG
Function	FN
Part	PT
Page	PG
Item	IT
Length of record	LG
Latency	LT
Port	PO
Response	RE
Flag #1	F1
Flag #2	F2
.	.
.	.
.	.
Flag #24	F24
Unanticipated	F27
Spell	SP
Code	CD
Mode	MD

Note: Spaces and carriage returns may be inserted or left out anywhere in the string of mnemonics in the characteristic file.

S A M P L E " W E E K L Y " P R I N T O U T

MITRE TICCIT WEEKLY REPORT SORTED BY NAME

COURSE/SECTION NUMBER: 181/05 DATE: 02/05/76

LP=NUMBER OF LESSONS PASSED
SW=START WEEK
TOL=TIME ON LINE
LD=LAST DAY ON SYSTEM
T/L=TRIES PER LESSON
0=LESSON BOX WAS PRE-SET TO GREEN AT BEGINNING OF COURSE
1=PASSED THE TEST THE FIRST TIME
2=PASSED THE TEST THE SECOND TIME
3=PASSED THE TEST THE THIRD TIME
Y=LESSON BOX IS YELLOW
R=LESSON BOX IS RED
.=NEVER IN THIS LESSON

	UNIT:	24	23	22	21	20	19	17	16	12					
	LESSON:	000	00	00	000	0000	000	0000	0000	00					
STUDENT # NAME		321	21	21	321	4321	321	4321	4321	21	LP	SW	TOL	LD	T/L
555305250 C. PUTNAM		...	..	..	111	1231	111	Y...	....	11	12	4	000:00	00/00	1.2
081407345 E. ROBERTS		...	..	..	113	Y...	...	....	....	..	3	3	000:00	00/00	1.6
060320378 J. GENS		...	..	..	111	1111	...	111Y	....	..	10	4	000:00	00/00	1.0
121212121 M. BAILEY		...	..	..	11Y	....	...	....	....	..	2	3	000:00	00/00	1.
215409528 M. LEVAN		...	..	..	111	1111	111	1111	1211	Y.	18	4	000:00	00/00	1.0
373587790 R. BEACH		...	..	..	311	111Y	...	....	....	..	6	3	000:00	00/00	1.3
239047194 S. GUPTA		...	..	..	121	Y...	...	....	....	..	3	3	000:00	00/00	1.3
000018105 TOM MCMURCHIE		...	..	..	...	....	...	....	....	..	0	4	000:00	00/00	0.0
000018108 richard egan		...	..	..	211	Y...	...	....	....	..	3	4	000:00	00/00	1.3

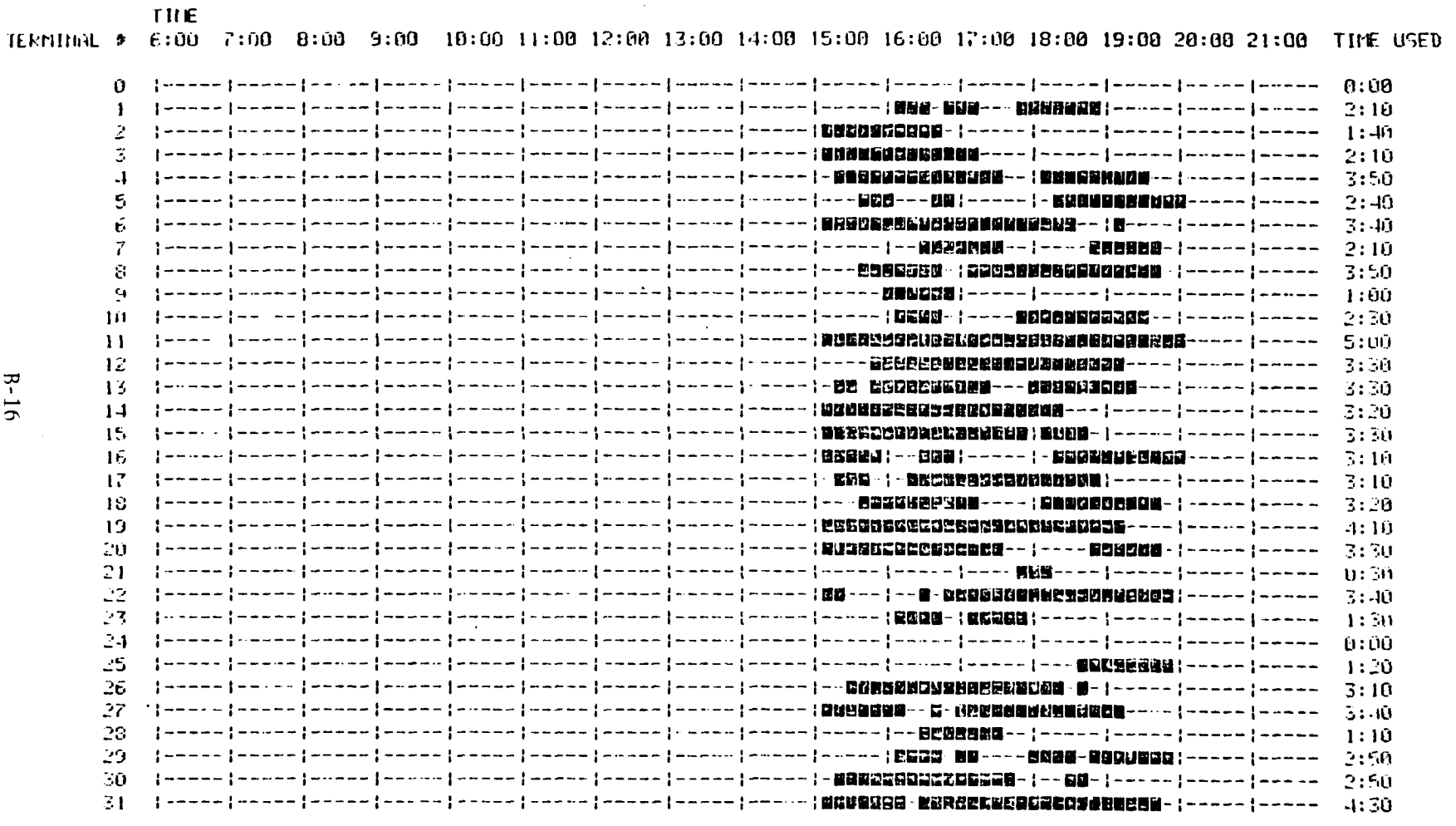
TOTAL TOL: 0:00 SOME AVERAGES TOL: 0:00 LP: 6 T/L: 1.2

S A M P L E " I T E M S " P R I N T O U T

COURSE UNIT 22 LESSON 04 DATE: 03/20/75

LABEL	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16	#17	#18	#19	#20	#21	#22	#23	#24	UH	PT	TOT	AV.TIME
3 F 02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.1
3 F 03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 07	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 09	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 55	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 63	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 67	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 70	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 71	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 72	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 73	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 74	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 81	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 83	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 86	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 87	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 88	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 89	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 91	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 93	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 96	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 97	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 98	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3
3 F 100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1.3

BRIGHAM YOUNG UNIVERSITY TERMINAL USE REPORT DATE: 03/02/76



TOTAL: 87:00

Name: MAKECOURSE (Continued)

Examples: (Continued)

FOR UNIT 3, DO ALL 4 LESSONS EXIST AND IS INITIAL COLOR OF ALL BOXES TO BE BLACK? (Y or N): N
(When the user answers "N", the program will inquire about each lesson individually.)
LESSON 1 STATUS (R, Y, G, U, K, C, W, N): K
(See description under "UNIT 1 STATUS".)
LESSON 2 STATUS (R, Y, G, U, K, C, W, N): W
LESSON 3 STATUS (R, Y, G, U, K, C, W, N): N
LESSON 4 STATUS (R, Y, G, U, K, C, W, N): K
CREATED PDA101
COURSE NUMBER: 999
(This begins the dialog for another course.)
HIGHEST UNIT NUMBER: 0
(A course with 0 units must be a special non-map non-primary instruction course such as the system menu used for data entry.)
CREATED PDA999000
COURSE NUMBER:
R

Errors: STATIC.SV DOES NOT EXIST!! (This file is used by the program and must exist to run it.)
INVALID COURSE NUMBER
COURSE nnn ALREADY EXISTS
INVALID MODULE NUMBER
INVALID LESSON NUMBER

REGISTER

Format: REGISTER filename

Purpose: To add and drop students from the authorization directory, etc. Also, to change information about a student who is already registered for a course.

Switches: None

Asterisk: Not Permitted

Example: REGISTER REG1

Where REG1 contains:

```
1  537219614  JAMES, WILLIAM R                    ØØ1  Ø4

2  927341129  CLAYTON, WAYNE                      Ø13
```

This adds William James to course ØØ1, section Ø4 and it drops Wayne Clayton from course Ø13.

Comments: Valid fields in the registration file are described in the documentation of the on-line registration file builder. This program also updates data reduction data bases; see notes at beginning of this section. However, students registered for section Ø of any course do not appear in data bases or reports.

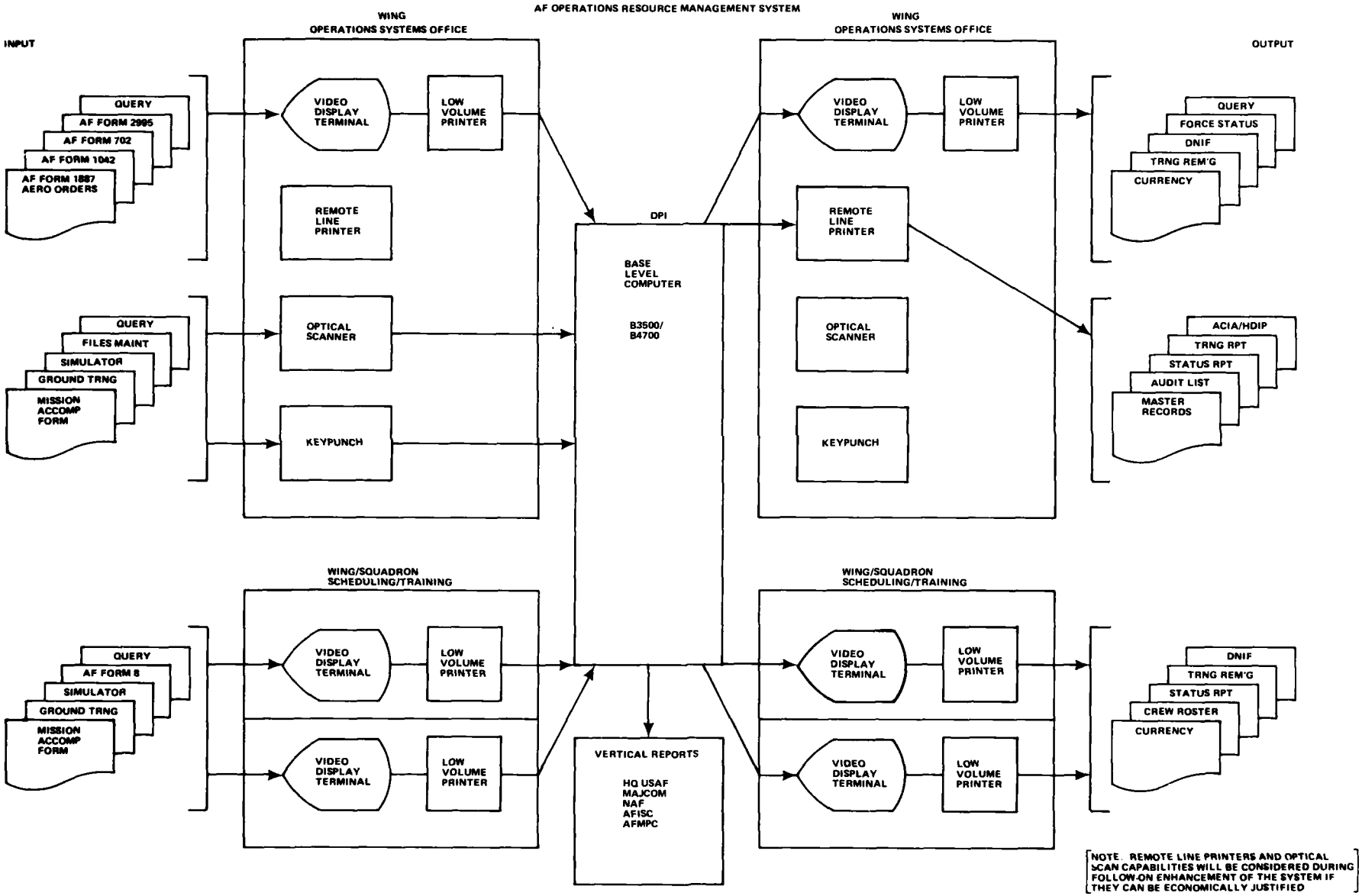


Figure 1. Complete AFORMS System

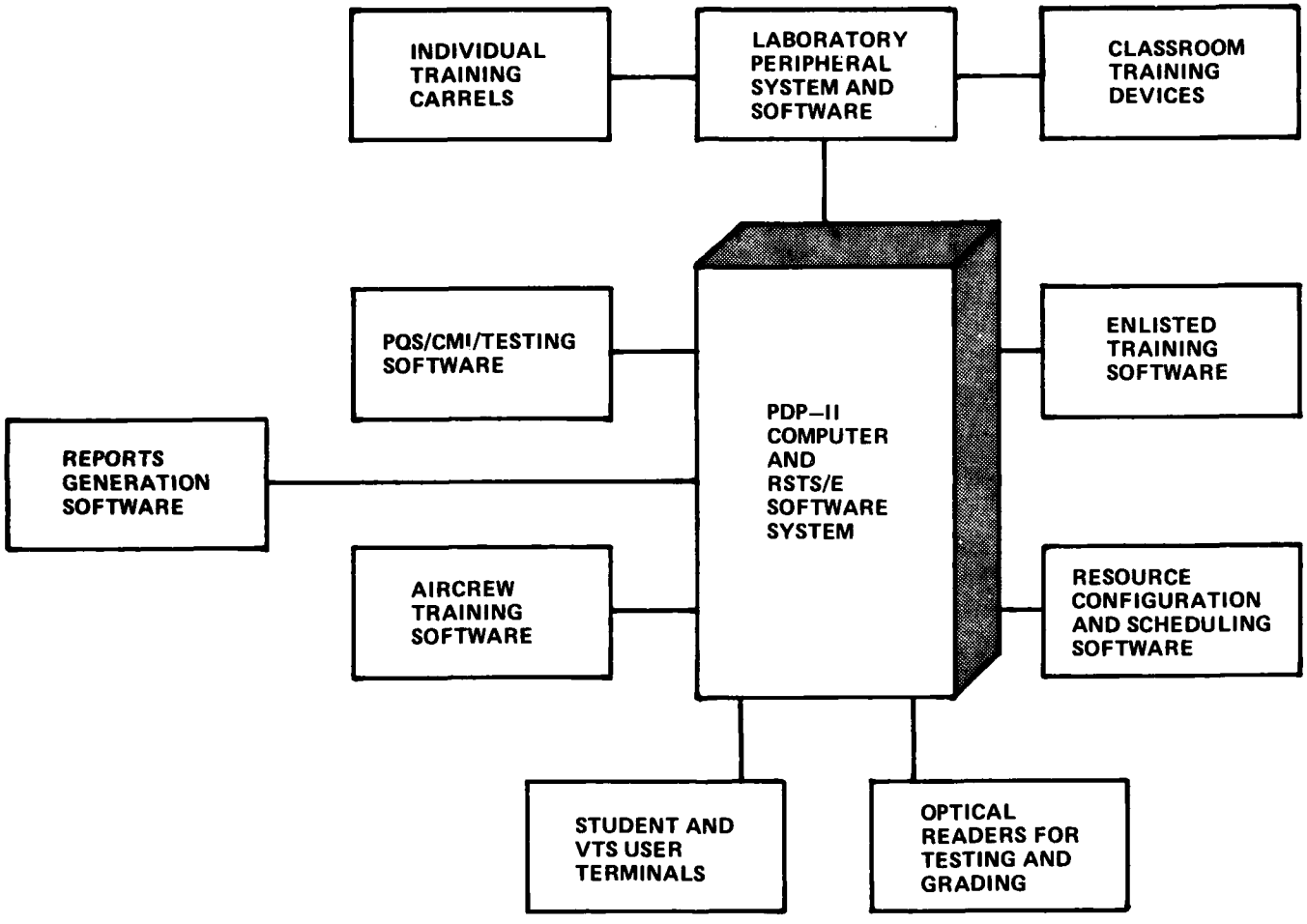


Figure 2. Complete Versatile Training System (VTS)

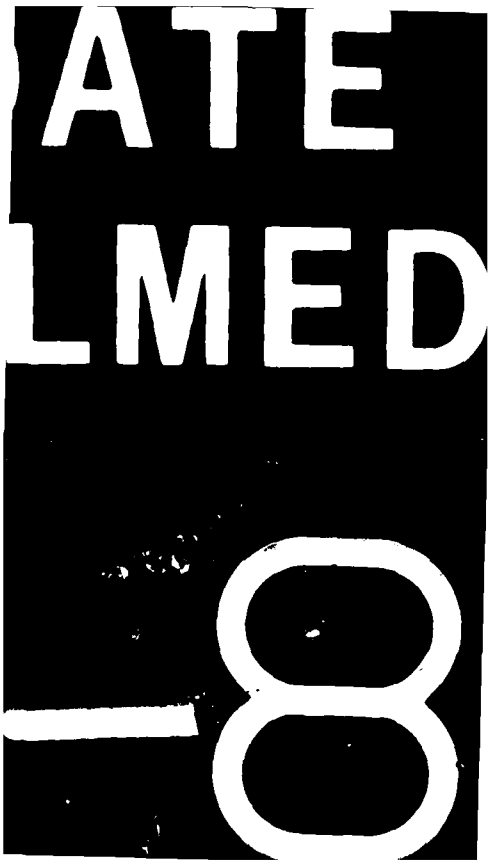
Table 3. Data on F4/F15 Training Programs

Courses	F-4 Instr. Upgrade "I" Pilot	F-4 Instr. Upgrade "I" WSO	F-4 Pilot (UPT/FLIT) B	F-4 Pilot FAIP C	F-4 WSO B00W	F-4 Previous Experience TX	ARF F-4 Guard	F-15 "TX"	F-15 "B"
Flights Simulators & Trainers ACAD + AV	36 (25) 41.5 97	12 39 107	49 65 208.5	40 58 208.5	26 70.5 225	18 16 9 31 29 24 133.5	13 13 14 24 24 36.5 36.5 113.5 111.5	21 35 72	41 56 103.5
Tests	11		17	16	15(+2 labs)	3	3	3	6
Length Training Days	49		95	75	71	31	26	43	80
No. Students/year	110		(VN-1200 max) 200 pilots 200 WSO		100		170	50	200
No. Students/Class	12		12 6 - 22		8 4 - 12	12 2 - 20	8 6-10		
No. Training Bases Training Squadron;Base	4 (1/2)		(4/9)		(3/4-5)	(1/4)	(2/2)	1 2 (4)	1
Admin Support	4-6 Squadron								
Schedule Support Wing -- Squadron-- Acad.--	2/1 2/2 2/2 2/2								3/2 2/2 1/4
Academics Instr. (T+S)	6-20+ per base								4 IP 1 Enlist.
IP's Assgn Attached	8-16/Squadron 8/2-16/2								12/2 8/2

Note : Estimates of real numbers by F-4 and F-15 ISD teams vary widely with circumstances and assumptions. Figures here are generally accepted estimates by those teams.

Table 4. Comparison of 5 Systems for F-16 CMI Suitability

	AFORMS	TICCIT	VTS	NAVY CMI	AIS
I. FUNCTIONAL CAPABILITIES TESTING					
Auto. Test Grading		X	X	X	X
Diagnostic Testing		X	X	X	X
Test Security		X		X	
Assess. Instr. Effect.		X		X	X
Student Feedback		X	X	X	X
STUDENT RECORDS					
Bibliographic info.	X	X	X	X	X
Report Generation	X	X	X	X	X
Sort Capability		X	X		
SCHEDULING					
Track Schedules	X		X	X	X
Generate Schedules			X	X	X
Project Schedules			X		X
INVENTORY					
Personnel Availability	X		X	X	X
Facilities Available			X		X
Project Resources			X		X
PRESCRIPTIONS					
Individual Prescriptions		X	X	X	X
Resource Prescriptions			X		
II. OPERATIONAL STATUS					
Completely Operational		X		X	
Partially Implemented	X		X		
Prototype					X
III. REMOTE CAPABILITY					
Stand-alone		X	X		
Distributed	X			X	X
IV. TRAINING STATUS					
Aircrew Training	X	X	X		X
Approved Training Device			X		
V. COST					
High (> $1 Million)	X			X	X
Low (< $1 Million)		X	X		


ATE
LMED
8